AUGUST, 1921 NUMBER 188

UNIVERSITY OF NORTH CAROLINA RECORD

RESEARCH IN PROGRESS

JULY, 1920---JULY, 1921

GRADUATE SCHOOL SERIES No. 4

PUBLISHED MONTHLY BY THE UNIVERSITY
Entered as Second-class Matter at the Postoffice at
CHAPEL HILL, N. C.

Digitized by the Internet Archive
in 2013

http://archive.org/details/universityofnort188univ

RESEARCH IN PROGRESS

JULY, 1920--JULY, 1921

The following pages contain a record of such activities of the Graduate Faculty and of advanced students as are related to the advancement of learning. Publications of a general or popular nature, public addresses of the faculty, and the project work, or elementary research conducted in undergraduate classes are not included. Abstracts of dissertations of candidates for higher degrees are included, even when these dissertations have not yet been published, because such work comes within the field covered by this bulletin. In the appendix will be found an abstract of the work of the Graduate Club. This organization differs from the other research organizations at the University in that its purpose is to bring about closer relations among the various departments and to show the interdependence of the fields of learning. The informal talks made during the past year by members of the Graduate Faculty aimed not at presenting results of original research in a technical sense so much as at supplying illustrations of method. The chief value of the meetings, therefore, was in the clearer grasp of the method of research made possible through concrete illustrations of work actually being done by members of our group.

A fund of one thousand dollars, available for the year beginning September first, has been placed at the disposal of the Administrative Board for the assistance of members of the faculty in carrying on their investigations. The program for the expenditure of this fund, as determined by the Administrative Board, is as follows:

1. While no restrictions have been imposed by the President and Trustees, the Administrative Board thinks it best to apportion this sum in such a way as to aid a number of researches rather than to give all or a major part of it to one or two men. Preference will also be given, in the set of awards, to researches that may be completed within a year or thereabouts, although more extensive projects may be aided where a clear case for them is made out.

2. Members of the Faculty are invited to send to the Board brief statements of such research projects as they have in hand, or desire to

undertake, as require the assistance of money from this fund. These projects may be: (a) such as may be completed within approximately a year; (b) larger projects, extending over several years, with an estimate of cost for the first year, and, if possible, an approximate estimate of the total cost. To receive consideration by the Board, the statement of the field and scope of the research, and the purpose for which the money is asked, must be very specific.

3. It is not expected that apparatus such as a scientific laboratory should ordinarily be expected to contain, or books such as the Library should possess, will be cared for under this grant. But special supplies, to be used only for the research project, may be included.

4. Money will not be appropriated by the Board for the employment of an assistant to relieve the research worker from his regular duties, or for a research assistant here at the University. But money may be supplied, if necessary, for work to be done by a competent person in a large library in this country or abroad, in a research laboratory where work not possible here may be done, or for the collection of material not otherwise available. For example, if a manuscript is to be photographed or transcribed, or a text established, or bibliographical aid is needed to enable a research worker to proceed with a project, money may be supplied from the fund for such work.

5. A formal written report of the progress of the research will be expected from each investigator who receives aid from this fund. This report is to be made in duplicate, one copy being sent, in June of each year, to the Dean of the Graduate School and one copy to the President of the University. Money under this grant will not be available until October 1, but the Administrative Board hopes to make a preliminary survey and award grants before the close of the present academic year.

6. As the Board has no data before it concerning research now in progress, the foregoing program is necessarily tentative. If a particular problem seems not to be covered by the illustrations given above, the investigator is invited to present it to the Board, with such reasons for a grant of money as he may be able to give.

7. As an aid to its survey of the possibilities for further development of research at the University, the Administrative Board invites suggestions from members of the Faculty on the following points: (a) fields now unworked, or partially worked, in which this University may hope to do unique or outstanding work; (b) what is necessary, in laboratory or other equipment, or in personnel, to develop these fields; (c) improvements in local conditions, such as relief from teaching, short term leaves of absence, and the like, that may be advisable; (d) personal reactions or opinions on the entire subject.

A number of applications have been acted upon, and other grants will be made in September. A detailed report of these grants, and of the results, will be included in this Bulletin in 1922.

The Graduate School includes not only those who are candidates for the higher degrees of this University but also all those members of the staff who are engaged in investigation and in the training of students to become investigators. Teachers who are interested in research, therefore, are members of the Graduate School equally with advanced students who are registered in formal courses. There can be no Graduate School, in the true sense, unless this union of scholars is a vital fact. The student gains inspiration and guidance from this association, factors quite as important in the making of a scholar as the knowledge to be gained from his formal courses. The teacher retains his membership in a group of scholars. He is not an isolated worker, but one of a fraternity. His research is not something done merely in spare moments, apart from his regular work; his research and his teaching become an organic unity. For this reason the Graduate Club, the opportunities for participation in the research fund, and the following record of the progress of investigation at the University during the past year, are all means by which the Graduate School seeks to realize its province as a division of the University.

Edwin Greenlaw, *Dean.*

DEPARTMENT OF ANATOMY

Charles S. Mangum, under the direction and with the coöperation of Dr. Frederick T. Lewis, of the Harvard Medical School, is working upon a "Reconstruction of the Brain and the Cerebral Nerves of a 24 mm. Pig Embryo." The investigation includes the following topics:

1. Extent of development. 2. Relation of the development of the ganglia to that of the cerebral nerves. 3. The cervical sympathetic chain and its early relations to the cerebral nerves and to the spinal nerves in the neck. 4. The relation of the cerebral nerves to the cervical spinal nerves. 5. The Nervus Terminalis in the 24 mm. Pig Embryo. This work is nearing completion and should be finished within the year.

W. C. George. An Interesting Anomaly in the Pulmonary Veins of Man. To appear in the *Proceedings of the N. C. Acad. of Sci., Jour. Elisha Mitchell Sci. Society.*

A report is here made of an anomaly found in one of the cadavers of the Anatomical Laboratory of the University of North Carolina. A large

vein about a cm. in diameter emerges from the middle of the ventral surface of the upper left lobe of the lung and courses cephalad to empty into the left innominate vein. The probable origin of this vein from the embryonic anlage of the left bronchial vein and that portion of the accessory hemi-azygos between the innominate and the junction of the bronchial with the accessory hemi-azygos is shown.

At a recent meeting of the Elisha Mitchell Scientific Society Mr. George presented a paper on *The Comparative Anatomy of the Brain*, in which some of the relations existing between environment conditions, habits of life, and brain structure in vertebrates was brought out. His study of the influence of environmental factors upon the differentiation of the nervous system is being continued. Mr. George is also engaged in an experimental study of the influence of certain internal secretions upon differentiation and the determination of the sex ratio in the development of the frog.

DEPARTMENT OF BOTANY.

W. C. COKER has published the following articles in the *Journal of the Elisha Mitchell Scientific Society* during the past year:

Azalea atlantica Ashe and its Variety luteo-alba n. var., with two plates, one of which is in color, Vol. 36, pp. 97-99, Pls. 1 and 7, September, 1920. *Azalea atlantica* was described by Mr. W. W. Ashe in the *Bulletin of the Charleston Museum* (Vol. 13, p. 26, 1917). A full description is given of this plant with records of collections from several places in North Carolina and South Carolina, showing that its distribution probably covers the coastal plain of the two states. *Azalea* var. *luteo-alba* is a new variety with smaller flowers, white when open, but with the buds and opening flowers tinged with yellow. This variety has been found only at Hartsville, S. C.

Notes on the Thelephoraceae of North Carolina. Vol. 36, pp. 146-196, Pls. 14 35, February, 1921. Six of these plates show spores and other microscopical details and the rest are photographs. Descriptions with keys to many of the species of this family are given. Most of the genera of the family are composed of very insignificant species of slight popular or economic interest, except where involved in the rotting of timber. Only a few of the genera have been treated fully; in others only a few representative species are treated.

The current *Journal of the Elisha Mitchell Scientific Society*, Vol. 37 (August, 1921), in continuation of the series on North Carolina mushrooms,

will contain a chapter on the *Collybias of North Carolina, by* W. C. Coker and H. C. Beardslee. It will include twenty-one plates, one of which is in color, one of spore drawings, and the others photographs.

A volume on the *Mushrooms of North Carolina* is in preparation for the North Carolina Geological and Economic Survey. This will contain all chapters so far published in the *Journal of the Elisha Mitchell Scientific Society* on the subject of the Basidiomycetes. It will also contain a chapter not before published on the Polypores of the state. Mr. J. N. Couch, Graduate Fellow in Botany, and Mr. F. A. Grant, Assistant in Botany, are working during the summer on the microscopical details of several groups of the mushrooms for this volume.

The monograph on the *Saprolegniaceae of the United States, with Notes on Other Species,* has been delayed for various reasons, but is now in proof and is expected to be published in the coming fall.

Mr. Coker is spending the summer in Europe visiting a number of the most important herbaria in order to secure data for the completion of his book on the *Clavarias of the Eastern United States;* and for further study of some of the other Basidiomycetes.

H. R. TOTTEN is continuing his studies on the sexuality of plants. Further studies are being made on the seed development of *Mayaca aubleti* and *Juniperus virginiana* of the higher plants. Of the fungi, single spore cultures of several of the higher Basidiomycetes are to be investigated and of the Saprolegniaceae the formation of the egg and its fertilization of *Achlya stelligera* are under investigation.

J. N. COUCH, in collaboration with W. C. Coker, published during the year *A New Species of Achlya,* a description of *Achlya orion, Journal of the Elisha Mitchell Scientific Society,* Vol. 36, pp. 100-101, September, 1920. A photograph of this species with drawings will appear in W. C. Coker's monograph on the Saprolegniaceae to be published soon. This same volume will include a description of a new variety of Achlya, *Achlya apiculata prolifica* n. var., found growing in a pond near Charlotte, N. C.

Spore formation and discharge in the Saprolegniaceae is now under investigation.

Mr. Couch is working during the summer on the microscopical details of several groups of the higher fungi for the volume by W. C. Coker on the *Mushrooms of North Carolina.*

An investigation into the conditions of science teaching in the accredited high schools of the state is being made and the results will be published soon.

DEPARTMENT OF CHEMISTRY

ALVIN S. WHEELER.

Para-Cymene as a Solvent. *Jour. Amer. Chem. Soc.,* 42, 1842 (1920).

Abstract given in Research in Progress for 1920, page 12.

ALVIN S. WHEELER AND S. C. SMITH.

Ethers Derived from the Addition Products of the Nitroanilines and Chloral. *Jour. Amer. Chem. Soc.,* 43,941 (1921).

Abstract given in Research in Progress for 1920, page 14.

ALVIN S. WHEELER AND T. M. ANDREWS (Ph.D. Thesis, 1921).

Hydroxynaphthoquinone Studies. IV. New Derivatives of 2,3,8-Tribromo-5-hydroxy-1,4-naphthoquinone.

The preceding papers in this series were published in the Journal of the American Chemical Society: 38, 387 (1916); 39, 246 (1917); 41, 833 (1919). The variety of the compounds which we have obtained from tribromo-hydroxynaphthoquinone (A in this abstract) demonstrates its very active nature. The unusual activity of one bromine atom indicates its presence in the phenol ring but all of the substituted groups and atoms will enter into reaction. All of the bromine atoms were removed with zinc dust in alkaline solution, giving *1,4,5,8-tetrahydroxynaphthalene,* $C_{10}(OH)_4$, which crystallizes from ether in plates of a light gray color melting at 224°. Reduction of the *8-hydroxy derivative* of A in sulfuric acid solution with zinc dust leaves two bromine atoms untouched, giving *1,4,5,8-tetrahydroxy-2,3-dibromonaphthalene,* $C_{10}H_2Br_2(OH)_2$. It crystallizes from chloroform in long colorless needles which melt at 164-6° with decomposition. Yield is 90% of weight taken. Calc. for Br, 45.71%. Found, 45.48%. *Tetracetyl derivative,* $C_{10}H_2Br_2(OCOCH_3)_4$, is obtained by boiling the preceding compound with glacial acetic acid for 20 hours. Short colorless needles from acetic acid. Melt at 149°-150°. Calc. for $C_{18}H_{14}O_8Br_2$: Br,

30.89%. Found: 30.87%. In like manner dihydroxydibromonaphthoquinone is acetylated but to our surprise only one OH group is affected. The product is *5-acetoxy-8-hydroxy-2,3-dibromo-1,4-naphthoquinone,* light yellow prisms from acetic acid, melting at 197° to a red liquid. Calc. for $C_{12}H_6O_5Br_2$: Br, 40.92%. Found, 40.58%. The reduction of A with zinc dust in sulfuric acid solution gives *1,4,5-trihydroxy-2,3,8-tribromonaphthalene,* none of the bromine atoms being affected. The product crystallizes from benzene in light grayish green needles in clusters which melt at 106°-107°. Calc. for $C_{10}H_5O_3Br_3$: Br, 58.11%. Found, 57.98%. Semicarbazine, a ketone reagent, gave a reaction but the nature of the product could not be determined. *Acetyl derivative,* pale yellow needles melting at 219°-220°. Calc. for $C_{16}H_{11}O_6Br$: Br, 44.53%. Found, 43.99%. The *methyl ether,* $C_{10}H_2O_2Br_2OH.OCH_3$, was obtained by boiling A (Na salt) with methyl iodide for 15 hours. The ether crystallizes from benzene in golden red plates which melt at 209°-210°. Yield 90%. Calc. for Br, 44.20%. Found, 43.86%. A pure sodium salt could not be prepared. The *ethyl ether,* $C_{10}H_2O_2Br_2OH.OC_2H_5$, was prepared by using ethyl iodide. It crystallizes from alcohol in thin yellow plates which melt at 134°-136°. Yield. 88%. Calc. for Br: 42.55%. Found, 42.06%. One bromine atom was lost owing to the action of hot alcohol. *Sodium salt,* reddish purple. Dyes silk a light champagne color. *5-Acetoxy-8-chloro-2,3-dibromo-1,4-naphthoquinone,* $C_{10}H_2O_2Br_2Cl.OCOCH_3$, was prepared from the corresponding hydroxy compound by boiling 16 hours with acetic anhydride. It crystallizes from alcohol in light yellow prisms which melt at 160°. Aromatic amines react with A replacing the Br atom at position 8 with amine residues. *8-Anilino-5-hydroxy-2,3-dibromo-1,4-naphthoquinone,* $C_{10}H_2O_2Br_2OH.NHC_6H_5$, was prepared by boiling an alcoholic solution of A with aniline for six hours. Reddish brown needles of peculiar shape like broken knife blades, which melt at 235°. An experiment was carried out with double the amount of aniline but the same product was obtained. Calc. for Br: 37.82%. Found, 37.92%. *8-o-Toluino-5-hydroxy-2,3-dibromo-1,4-napthoquinone,* $C_{10}H_2O_2Br_2OH.NHC_6H_4CH_3$, was obtained by using o-toluidine. Reddish brown flat needles from acetone, melting at 188°-189°. Calc. for Br, 36.61%. Found, 36.80%. *8-p-Toluino-5-hydroxy-2,3-dibromo-1,4-naphthoquinone,* $C_{17}H_{11}O_3NBr_2$, from p-toluidine. Crystallizes from acetone in reddish brown rectangular plates, melting at 216°-217°. Calc. for Br: 36.61%. Found, 36.76%. *8-p-Bromoanilino-5-hydroxy-2,3-dibromo-1,4-napthoquinone,* from *p-bromoaniline.* Crystallizes from acetone in long reddish brown prismatic needles which melt at 254°-256°. Calc. for $C_{16}H_8O_3NBr_3$: Br, 47.81%. Found, 47.99%. A reaction between A and p-nitroaniline was obtained but analysis of the product indicated some other type of reaction.

ALVIN S. WHEELER and IRA W. SMITHEY (Ph.D. Thesis, 1921). Para-cymene Studies, III. The Bromination of 2-Amino-para-cymene.

The two previous papers in this series were published (1) in the *Jour. Ind. Eng. Chem.,* 10, 359 (1918) and (2) in the *Journ. Amer. Chem. Soc.,* 42, 1842 (1920). In this thesis is given a full description of the best method

of nitrating p-cymene to 2-nitro-p-cymene. The nitrocymene is reduced with tin and hydrochloric acid to 2-amino-p-cymene and then acetylated in order to protect the amino group in the bromination process. The acetyl derivative is brominated in carbon tetrachloride solution, giving a monobromo derivative, *2-acetylamino-3-bromo-p-cymene,* $C_6H_2.CH_3.NHCOCH_3$. Br. C_3H_7, which crystallizes from alcohol in colorless needles which melt at 122.5°. Yield practically quantitative. Calc. for $C_{12}H_{16}ONBr$: Br, 29.62%. *Hydrobromide* crystallizes from alcohol in colorless silvery octagonal plates Found, 29.38%. The acetyl derivative was hydrolyzed to the *Hydrochloride* by boiling with concentrated hydrochloric acid. It crystallizes from alcohol in silvery hexagonal plates which melt at 205°-210° with decomposition. Calc. for $C_{10}H_{14}NBr.HCl$: Cl, 13.41%. Found, 13.81%. The *Hydrobromide* crystallizes from alcohol in colorless silvery octagonal plates which melt at 200°-205° with decomposition. This salt is hydrolyzed even by cold water. Calc. for $C_{10}H_{14}NBr.HBr$: 1 Br, 25.88%. Found, 26.04%. The most important compound of this research is the following. *2-Amino-3-bromo-p-cyemene,* $C_6H_2.CH_3NH_2.Br.C_3H_7$, is obtained by the hydrolysis of the hydrochloride described above, using sodium hydroxide. Colorless oil, turning yellow and finally red on standing. Boils at 169°-170° at 20 mm. pressure. Sp. gr. at 21° is 1.30125. Refractive index at 20°, 1.5781. Calc. for $C_{10}H_{14}NBr$: Br, 35.04%. Found, 35.08%. It was submitted to a series of diazo reactions. *Diazo-2-amino-3-bromo-p-cymene,* $C_6H_2CH_2BrC_3H_7$-$N{=}NNHC_3H_7BrCH_3C_6H_2$, was obtained by treating one molecule of aminobromocymene hydrochloride with a diazotized molecule of the same compound. It crystallizes from petroleum ether in yellow prismatic needles which melt at 143°-146° with decomposition. Calc. for $C_{20}H_{25}N_3Br_2$: Br, 34.29%. Found, 34.45%. *Benzenediazo-2-amino-3-bromo-p-cymene,* C_6H_2-$CH_3BrC_3H_7N{=}NNHC_6H_5$, was obtained by treating one molecule of diazotized aminobromocymene with one molecule of aniline hyrdochloride. Flat yellow needles which melt at 152°-154° with decomposition. Calc. for C_{16}-$H_{18}N_3Br$: Br, 24.09%. Found, 23.85%. *p-Nitrobenzenediazo-2-amino-3-bromo-p-cymene,* was similarly obtained by using p-nitroanline. It crystallizes from alcohol in bright yellow needles which melt at 158° with decomposition. Calc. for $C_{16}H_{17}O_2N_4Br$: Br, 21.22%. Found, 21.56%. Alkaline solutions possess a rich magneta color which disappears on neutralization or acidification. If a colorless neutral solution is heated, the color reappears, though of less intensity. The metallic salt probably ionizes in solution, giving a complex colored ion. If p-nitroaniline is diazotized and treated with aminobromocymene hydrochloride the product contains the imino group attached to the cymene nucleus. Orange red needles which melt at 163°.

Orientation. A great deal of work was done in order to locate the bromine atom in aminobromocymene. The bromine atom may occupy any one of seven positions, four being in the side chains and three in the nucleus. The first group are eliminated because bromination was conducted in cold solution and the character of the product is unlike compounds with halogen atoms so located. Therefore we sought to determine whether the bromine

atom was at position 3, 5 or 6. Aminobromocymene was acetylated and oxidized in neutral solution with potassium permanganate. Analysis showed that the isopropyl group was oxidized to COOH. This *acetyl bromotoluic* acid is a new compound. It consists of fine needles melting at 215°. Its *hydrochloride* crystallizes in leaflets melting at 190° with decomposition. On saponification it gave the *aminobromotoluic acid,* also new. It forms yellow needles from dilute alcohol and melts at 151°. There are three possible aminobromotoluic acids with Br at 3, 5 and 6 respectively. The acid with Br at 5 melts at 186°-187°. Since our acid melts at 151°, bromine cannot be at 5. The other two acids are not known. We select position 3 because Br does not enter the nucleus meta to the amino group but always ortho or para. The para position seems to be shut out.

Alvin S. Wheeler and Paul R. Dawson (Master's Thesis, 1921).

Hydroxynaphthoquinone Studies V. 2,8-Dichloro-5-hydroxy-1,4-naphthoquinone and Derivatives.

This dichlorohydroxynaphthoquinone was first described by Wheeler and Scott (*Jour. Amer. Chem. Soc.,* 41, 833, 1919). It was thought then that the chlorine atoms were located at positions 2 and 3, but further study leads us to the belief that they are located at positions 2 and 8, especially since one is so active, thus suggesting its presence in the phenol instead of of the quinone nucleus. The dichloroquinone is prepared by passing chlorine into a hot solution of juglone in glacial acetic acid. Care is required to avoid over chlorination. The dichlorohydroxynaphthoquinone (A) consists of orange colored needles which, recrystallized from ligroin, melt at 149°. Yield 4.3g from 4.0g of juglone. Treatment with benzoyl chloride gave the *Benzoate,* $C_{10}H_3O_2Cl_2OCOC_6H_5$, lemon yellow needles from benzene, melting at 225°. Calc. for Cl, 20.46%. Found, 20.53%. *Sodium salt* of A was made by shaking A in ether solution with aqueous sodium carbonate. Indigo blue powder, deep violet water solution. Calc. for Na, 8 68%. Found, 8.01%. *5,8-Dihydroxy-2-chloro-1,4-naphthoquinone* (B) $C_{10}H_3O_2Cl(OH)_2$, is obtained by treating A with hot 10% NaOH. The product precipitates on acidification. Yield 90% of the theoretical. Yellow brown needles from ligroin or alcohol. Melt at 191°. Calc. for Cl: 15.79%. Found, 15.83%. Neutral solution is deep red in color whereas the acid solution is yellow. *Acetyl derivative,* $C_{10}H_3O_2Cl\ (OCOCH_3)_2$, is obtained by boiling B with acetic anhydride for 8 hours. Fine yellow needles melting at 147°. Yield 90% of the theoretical. Calc. for Cl: 11.50%. Found, 11.64%. *Anilide* of A, $C_{10}H_3O_2ClOHNHC_6H_5$, is obtained by boiling an alcoholic solution of A with aniline. Yield 110% of weight of A. Crystallizes from acetone in flat violet red glistening needles, melting at 222°. Calc. for Cl: 11.84%. Found, 11.35%. The thesis describes oxidation experiments on A, discusses the position of the chlorine atoms and the possible isomerism of dichlorojuglone.

Alvin S. Wheeler and H. M. Taylor (Master's Thesis, 1921). An Investigation of Neutral Kelp Oils.

This work was done at the request of the U. S. Department of Agriculture. Only a beginning has been made. The oil which we received had been obtained at the Department's laboratory at Summerland, California, by distilling kelp tar and shaking the oil with acid and alkali, thus producing a neutral oil. We subjected it to distillation at 115 mm. pressure, obtaining 9 fractions boiling from 135° to 230°. The largest accumulation, 15%, occurred at 175°-185°. A higher vacuum was next used, 20 mm. Three fractions gave: water 0.75%; oil 59%; pitch 40.25%. The oil was distilled and 12 fractions, from 50 to 170 at 12 mm. pressure, were obtained. 88% came over between 100° and 160° and the specific gravity of these fractions rose from 0.9625 to 0.9900. The oil is clearly a mixture. Chemical means of purification were then tried. Boiling with soda lime seemed promising but 65% of the oil was lost. This seemed unnecessary. Metallic sodium was then tried. This caused the oil to become very hot, and to give off fumes of a garlic-like odor. After boiling one hour with 5% of its weight of metallic sodium, the oil was distilled at 20 mm., 65% being recovered between 60° and 155°. These fractions are pale amber in color and retain this color for a month but become red after two months. Oil obtained by previous methods above darkened in color in a very short time. The process of separation still being unsatisfactory the oil was frozen with carbon dioxide snow. The fractions representing the frozen and unfrozen parts are yet to be examined.

The oils dissolve in all organic solvents. Molecular weight determinations of the fractions gave values ranging from 124 up to 170. Nitrogen was found present to the extent of 1.03%. This is possibly due to an impurity. Refractive indices of six fractions were taken at 20° and they varied from 1.4165 for the fraction below 100° up to 1.4650 for the fraction 130°-150°. The fraction 110°-120° gave an iodine number of 161 and a specific gravity of 0.941 at 21°. The oils are highly unsaturated, absorbing four times their weight of bromine. The action is violent and it may be toned down by using carbon tetrachloride solutions. We intend to try hydrogenation of the oils under pressure hoping to get solid compounds to work with.

Alvin S. Wheeler and I. V. Giles (Progress on Ph.D. Thesis). Para-Cymene Studies. IV. The Chlorination of 2-Amino-p-cymene.

The main emphasis in the work during the past year has been upon the orientation problem of locating the chlorine atom which undoubtedly enters the nucleus in which there are three possible positions. The direction which the latest study has taken was to convert the chloroaminocymene into dichlorophthalic acid, a series of reactions being necessary. If this proves to be the 2,5-isomer, then the chlorine atom is in position 5. This phase of the investigation is nearly completed.

Alvin S. Wheeler and S. C. Smith (Progress on Ph.D. Thesis).

Para-Cymene Studies. V. The Bromination of 2-Nitro-p-cymene.

The principal work done this year has been to discover a method of preparing pure nitrocymene. A method which promises well consists in treating the crude nitrocymene with a small amount of bromine in the cold without a catalyst. The probabilities here are that the impurities are more readily brominated than the nitrocymene, for we have found that this requires a catalyst.

DEPARTMENT OF CIVIL ENGINEERING

Thorndike Saville spent the summer of 1920 as Hydraulic Engineer for the North Carolina Geological and Economic Survey. He was in charge of field parties making special investigations of the water power resources of Surry and Wilkes counties and of a number of selected sites in other parts of the state. These reports are to be printed by the Survey during the present year. In his connection with the Survey Mr. Saville has made a number of special studies during the year relating to the water resources and water powers of the state.

At present Mr. Saville has under way two major pieces of research. One is an investigation of the sands used in water filtration plants in North Carolina. This study was undertaken at the request of the State Board of Health in order to try to account for poor filtration at certain of the water purification plants. This study will be completed during the year. In April, 1921, through his connection with the State Geological and Economic Survey Mr. Saville was able to have an evaporation station established at the University by the U. S. Weather Bureau. This station is equipped with apparatus for the measurement of rainfall, evaporation, temperature and wind velocity. It is the first evaporation station to be established in the South Atlantic States and studies are being made to determine the relation and amounts of evaporation and rainfall. The annual loss by evaporation from storage reservoirs is a serious problem to water power and water supply projects and the first accurate information as to the necessary amount

for which to provide in this region will soon be available as a result of the operation of this station.

Abstracts of articles published by Mr. Saville during the past year are as follows:

"Relation of Water Resources to Forestry" (*Press Bulletin* [172] North Carolina Geological and Economic Survey. Reprinted in *The American City,* September, and *Public Works,* August, 1920.

The subject is considered from three standpoints: first, the effect of forests upon the occurrence and distribution of water, or the hydrological relation; second, the effect of forests upon public health and scenery from their presence on municipal watersheds and reclaimed swamps, or the public welfare relation; and third, the effect of forests upon waterpower, navigation, agriculture, etc., or the economic relation.

"The Water Powers of North Carolina (*Press Bulletin* [175] North Carolina Geological and Economic Survey, 1920).

A pamphlet summarizing the power situation in North Carolina and outlining the needs for additional hydro-electric power. A detailed policy is presented for prosecution by the State Geological and Economic Survey which comprises: I, A Power Census; II, A Water Resources Investigation; III, A State System of Power Development; and IV, A State Water Resource Law. Parts I and II are now being carried out and part IV will be presented to the next Legislature. An analysis is made of the relation of the Federal Power Commission to the development of hydro-electric projects in this state, and certain dangers to guard against in the encroachment of the Federal Commission upon the state domain are pointed out.

"Sewage Pumping Station at Langley Field, Virginia" (*Journal Boston Society Civil Engineers,* May. Reprinted in *Canadian Engineer,* July, 1920).

A description of an automatic sewage pumping station operated by compressed air. It was installed under the direction of the author and had certain novel features developed by him.

"Development of Rhone River for Water Power and Navigation" (*Engineering News-Record,* August, 1920).

Description of a project investigated in France by the author in the summer of 1919 whereby it is proposed to spend $300,000,000 to develop water power, improve navigation and provide water for irrigation. The first part of the project is now under construction.

"The Port of Marseilles and Rove Ship Tunnel" (*Engineering News-Record,* November, 1920).

Description of work investigated in France by the author comprising a harbor breakwater, with large concrete blocks, a huge tunnel through the Rove Mountains for a ship canal and development of shipping quays.

"Notes on English Sewage Works" (*Public Works,* January 8, 1921. Reprinted in *Canadian Engineer,* May 5, 1921).

Description of plants visited by the author in England and presenting observations of grease extraction as conducted at Bradford, Huddersfield and Morley and activated sludge experienced at Bradford, Manchester and Sheffield. Certain other special treatments are described.

"Notes on English Water Works" (*Public Works,* January 15, 1921.

A description of the water works of certain English cities, especially Liverpool, visited by the writer in 1919 on a graduate fellowship from Harvard University, on which the observations recorded in the three preceding articles were also made.

"Flood Control by Small Dams (*Public Works,* January 15, 1921. *Engineering and Contracting,* March 9, 1921).

This comprises excerpts from a paper delivered before the N. C. Drainage Association, and deals particularly with the relation of flood control to drainage. The control of floods by relatively inexpensive dams with a discharging conduit is proposed, similar to the flood regulation works of the Miami Conservancy District.

"Formula for Determining Settling Periods in Basins and Tanks" (*Engineering News-Record,* April 14, 1921).

A short formula is derived which simplifies computation of dimensions of settling tanks used in water and sewage treatment processes.

DEPARTMENTS OF ECONOMICS AND COMMERCE

A research station of the Bureau of Education of the United States in connection with Commercial Training has been established at this University with the Dean of the School of Commerce as collaborator. The first investigation is to be a survey of the business resources of North Carolina. This will consist of an analysis of the scope and volume of manufacturing

activities; the type and size of plant; kinds, sources, and cost of raw materials; value added by manufacturing process and destination of product; source of capital and prevailing methods of financing enterprise; kinds, quantities and source of power used; method and adequacy of transportation facilities and their bearing on the commercial development of the state; the number, quality and source of the labor supply. The investigation is already under way and will be continued under the direction of C. T. Murchison and D. D. Carroll.

E. E. Peacock of the Accounting Division, with the assistance of the Cost Accounting class, has made a study of the accounting systems in institutional dining halls and embodied it in a report which contains the outline of a system particularly devised for the University of North Carolina.

Walter J. Matherly is continuing the contribution of a series of monthly editorial articles to *Industrial Management,* and has published various reviews.

C. T. Murchison has in preparation a book to be entitled Cyclical Adjustments in Industry. It will have to do with the industrial manifestations of the business cycle in its separate stages of crisis, panic, depression, prosperity. Special attention will be paid to fluctuations in the volume of production, in the rate of interest, in the changing nature and volume of capital investments, in wages and employment, in price movements, and in the swing of consumption habits from waste and extravagance to the buyer's strike. The major part of the work will be confined to the period from 1913 to 1921.

Abstract of a thesis presented in candidacy for the Master's degree in the Department of Economics:

Some Practical Results of the Federal or Leitch Plan of Industrial Democracy. By Bryan W. Sipe.

The rise of modern machine and factory production is briefly reviewed with special reference to the relation of capital and labor in each stage. It is pointed out that at present workers and owners are wholly divorced from each other, and that a professional class of administrators stand between the two groups. The problem of industrial relations is stated to be the restoration of something of the personal touch between owner

and worker that existed in the earlier stages of production and the establishment of mutual confidence and understanding between capital, labor, and management. Some of the more comprehensive and better known plans, including the Federal plan, which have been proposed to solve this problem, are described.

Following this preliminary statement, the results of questionnaires sent to thirty plants (in fourteen States), which were using the Leitch plan, are classified and summarized at some length. It is found that this plan has, in many cases, established a more human relationship between the workers and the management; that under it "production has been increased; wastes reduced; unnecessary workers eliminated, resulting in decreased cost per unit of product; workers have been able to earn more; they have made valuable suggestions to employers; and, in a few cases, have invented labor- and time-saving devices." Regardless of this seeming success, the plan, in a number of cases, especially in those plants in which it has been in operation longest, has been changed considerably. A number of industrial leaders expressed the opinion that it would sooner or later have to give place to a plan which will provide for greater participation of labor in the management of industrial establishments.

The plan is critically analyzed in every detail and evidence submitted to show that it is too elaborate for the highly competitive industrial world, in which prompt action is frequently necessary; that it creates two bodies, a Cabinet and a Senate, composed of representatives of capital as against one body, the House of Representatives, composed of workers, and further, final authority is vested in the Cabinet. Thus, in reality, no concession of any consequence is made to workers. The collective economy dividend that accompanies the plan, a scheme for rewarding increased effort, is adjudged unsound in that the method of determining the efficiency of employees is based on whatever system of record keeping that happens to be in use, regardless of its adequacy or inadequacy; the dividend is distributed among all the workers without reference to individual production records; and savings created wholly by the workers are divided equally between the company and the men, whereas each group should share according to the contribution it makes to such savings.

Because of the limitations of the Federal plan, and since it is in line with past developments and present tendencies, it is predicted in the final pages of the essay that this plan, as well as the various other plans of employee representation, will successively be replaced by plans giving labor greater voice in the management of industry until industrial democracy is finally achieved. Opinions of employers, of students of industrial problems, and of popular writers are cited in support of this conclusion.

DEPARTMENT OF EDUCATION

E. W. KNIGHT has completed his study of the history of education in the South which is appearing in a volume entitled *Public Education in the South.* This is a study of the development of public education in the eleven Southern States which formed the Confederacy, and gives the first general survey yet published in a single volume of the growth of public educational organization and practices in those states. It traces the development of the democratic theory of education, seeks to explain the apparently slow application or practical acceptance of that theory, and to point out from the past certain valuable lessons for the teacher and administrator today. Public educational problems of today are set forth in the light of their historical development.

He continues his work on *Readings in Southern Educational History* which will be published as a companion study to *Public Education in the South.*

Graduate students in Mr. Knight's department are working upon the following subjects: "The Status of Consolidation of Schools and the Transportation of pupils in North Carolina" (R. K. Hancock). "The Ante-bellum Education Revival in the South" (Arthur Ranes). "Public Education in South Carolina Prior to the Civil War" (C. H. Weatherly). "The Status of Social Studies in the Rural High School" (R. R. Anderson). "The County Superintendency in North Carolina" (R. W. Whitener). "The County Superintendency in Virginia" (C. L. Cates). "The Problems of Education in Mill Villages" (Thomas W. Sprinkle). "Compulsory Attendance and Child Labor Practices" (J. T. Hatcher). "The Rural School in North Carolina" (George A. Short). "Public Education in North Carolina Prior to the Civil War" (R. N. Ledford). "The Rural High School in the South" (F. M. Arrowood). "Negro Education in the South" (G. Y. Newton). "The Relationship Between Economic Wealth and Public Education" (H. C. Renegar). "The Status of Science in the Rural High School" (W. M. Pickens). "The Rural School in Virginia" (James S. Hathcock).

Most of these studies will be completed during the coming year.

Abstracts of theses for the Master's degree in 1921 are appended:

Analysis of the Content of the American Histories Taught in North Carolina High Schools. By Mabel L. Bacon.

This thesis is based on a study of the five American histories recommended for use in the high schools of North Carolina.

It was found that as to content, there was a great difference of opinion among the authors as to what historical events should be treated; that the emphasis was placed by all the authors on military and political topics, so that from the treatment in the texts students would naturally get the idea that only military or political men ever obtain or deserve national renown, or that only military or political events are worthy of being remembered as historical facts.

Method and Content of the French Course in Accredited High Schools of the South. By James Arthur Capps.

In the 1920 meeting of the Southern Association of Accredited Schools and Colleges there was some discussion as to what should constitute an acceptable French course for the high schools of the Association. These discussions emphasized the importance of a better knowledge of what is being undertaken in the way of method and content by the French teachers at present.

With these suggestions in mind and working under the supervision of the Research Station of the United States Bureau of Education, located at the University of North Carolina, a study of the subject was undertaken in 1920-1921.

The questionnaire method of procedure was relied upon for getting the information used in the study. Such information is hardly exact, though it reveals general tendencies. The brief given below is a result of replies received from 35.5 percent. of the high school members of the Association.

I. The extent of the course:

(a) Eighty-six percent. of the schools teach French for a period of two years or more.

(b) As a required subject French is taught only two years.

(c) The average length of a class period is forty-five minutes, covering five periods per week.

II. Organization of class work:

(a) During the first year of the course nearly five-eighths of the class periods are given to the study of grammar. The remaining three-eighths are devoted to oral composition, translation and dictation.

(b) Sixty percent. of the teachers do forty percent. of their work in the native tongue.

(c) Few teachers have any set standard or rule to go by in proportioning the class periods to the different phases of the class room work.

III. The scope of the work:

(a) In deciding the amount of territory to be covered in one year the teachers are influenced by college entrance requirements and by general class conditions.

(b) There is no standard as to the number of irregular verbs studied during the first year, eighteen being the average and sixty-nine the greatest number undertaken by anyone.

(c) During the first year of the course two hundred and twelve pages of translation is attempted; two hundred and sixty-eight the second, and about four hundred and fifty during the third year.

IV. Methods used in teaching:

(a) The combination method is used by sixty-seven percent. of the teachers.

(b) Several teachers say that the direct method is impractical because the pupils do not receive proper training in English grammar.

V. Popular devices of motivation used by teachers:

(a) Club work and Victrola.

(b) "Circle Française" and correspondence with French boys and girls.

(c) Games and mock meals.

VI. The purposes of teaching French in American schools:

(a) To teach the pupil to read and write the French language.

(b) That the boys and girls may learn to love and appreciate French literature.

(c) That we may gain a better knowledge of the French people, commercially and socially.

VII. The pupil's relation to foreign languages:

(a) Less than ten percent. of the high school pupils graduate without being required to study a foreign language.

(b) Thirty-five percent. of the boys and thirty-three percent. of the girls enrolled in high schools study French as a free elective.

A Latin Form Test for High Schools. By Harry Franklin Latshaw.

This study is an attempt to apply the methods of educational measurement to High School Latin. It carries forward the work begun in this field by Mr. L. L. Lohr, Jr., in 1918. The problem is to devise a test and scale suitable for use with high school students in ascertaining their ability in the recognition of Latin forms.

The method of procedure was to prepare a preliminary test which was given in various North Carolina high schools under uniform test condi-

tions. Through the statistical analysis of the 714 test papers thereby secured, a standard test was made.

This standard test measures the number of Latin forms of approximately equal difficulty which a pupil can identify without error within a fixed period of time. Tentative January norms of ten, thirteen, and fifteen were established for the second, third, and fourth high school years in North Carolina.

Test material, suitable for printing, for use in giving and scoring the test has been formulated.

The Status of the Acted Drama in the Colleges and Universities of the United States. By Sylvia A. Latshaw.

The United States Bureau of Education, at the suggestion of the Drama League of America, mailed to certain institutions, in June, 1920, through its Research Station at Chapel Hill, a questionnaire on the status of the acted drama in our colleges and universities. This report was made chiefly from information furnished by the 164 institutions which replied.

Most of the schools give courses in drama, dealing with dramatic appreciation, composition, and production. For the first two academic years credit is given, but not, usually, for the last. In some cases credit is given for acting when it is included as part of a college course. Extra curriculum dramatics are sometimes correlated with academic work.

One hundred and fifty dramatic organizations were reported, having about 4,326 members. There are many other producing groups not organized. Plays are given in college halls, 17 theatres, and 27 out-door theatres. Performances are directed by professional coaches, by student directors, and chiefly, by members of the faculty. About 281 original plays, and 807 plays not original have been given in the past five years.

The University theatre is contributing to the professional stage through courses in drama, and through schools of drama. Certain institutions have established community theatres and others are fostering drama in rural communities throughout the country. Folk playmaking is being developed at a few universities. Pageantry is being fostered through courses in pageantry, presentation of pageants, and encouragement of communal pageantry.

There are indications that, in the near future, many institutions will secure trained teachers of drama, provide adequate equipment, and arrange that fitting credit be given for the study of the theatre arts.

DEPARTMENT OF ENGLISH

EDWIN GREENLAW has served as a member of the editorial board of Collier's New Encyclopedia and has contributed articles on various Renaissance topics to it. He has also contributed to *Studies in Philology* reviews of six books dealing with various phases of the Renaissance. During the summer of 1920 he worked in the Columbia University Library, and in 1921 at the Widener Library, chiefly on the history of learning in the Renaissance, with studies in the influence of medieval learning on the later period. Some results of these studies will appear as monographs during the year, but the ultimate purpose of these studies, which have been continued for many years, is a book on the history of the Renaissance in England. The following monograph has been published:

Spenser and Lucretius. *Studies in Philology*, XVII. 439-464.

While the main elements in Spenser's philosophy were derived from Plato and from Renaissance developments of Platonic doctrine from Ficino to Castiglione, the poet was also learned in the Epicurean philosophy. This philosophy came to him through Lucretius, and the essay points out for the first time the exact and extensive knowledge of *De Rerum Natura* that permeates the *Faerie Queene*. Besides scattered references throughout his work, there are two passages of considerable extent, quite different from the remainder of the poem and presenting a theory of nature different from that of the *Fowre Hymnes*. The first of these is the account of the Garden of Adonis (*F. Q.*, III, vi). In part this passage shows the influence of parts of the *Republic* and the *Timaeus*, and shows also the influence of the Pythagorean philosophy as set forth in the fifteenth book of Ovid's *Metamorphoses*, but the main part of the theory of nature set forth by Spenser is from Lucretius. The account of the origin of organic life is very similar in the two poems, parallel passages being adduced to make this relationship clear. The debt is chiefly to books I and V of *De Rerum Natura*, but the second book is also drawn upon. The most remarkable parallels, however, are in Spenser's adaptation of the Lucretian atomic system. The parallels are numerous, and the imitations are even verbal in part.

The second passage includes the greater part of the cantos on Mutability, supposed to be a part of an unfinished book of the *Faerie Queene*. The masque of the seasons owes something, perhaps, to Ovid, but Spenser's conception of the philosophy of change is far more Lucretian than Ovidean. Ovid deals merely with change, or transformation; Lucretius and Spenser deal with the mutability of all things. Moreover, the intellectual atmosphere and the entire plan of Spenser's poem, chiefly in the second canto, follow closely the fifth book of Lucretius, the order of topics being the

same and many lines and even whole stanzas being paraphrases of Lucretius' argument. Even the climax of the Latin poem, by which the poet seeks to overthrow religious superstition, finds place in Spenser. The conclusion is that to our previous knowledge of Spenser's intellectual interests must be added a body of material that is both extensive and important. It has high imaginative value, and points to an intense intellectual interest in the scepticism of the Roman poet. It adds new interest to the Mutability fragment to see that though unlike the remainder of the *Faerie Queene* it is yet intimately related to a unique and powerful passage in the third book. Doubts that have been expressed from time to time as to the Spenserian authorship of the fragment are removed by the study, since this connection with the third book proves it to be by the same author. And while Spenser never worked out a consistent philosophy on this basis, the study shows his interest in the scepticism that was an important element in the thought movement of his time.

NORMAN FOERSTER has spent the year in study and travel abroad, on leave of absence. Most of the time he has been in residence at Oxford. He has contributed various reviews to American journals; an essay on Whitman to the *North American Review.* His book, *Nature in American Literature,* has been accepted for publication by Houghton Mifflin Company. He is at work upon a book to be entitled *Literary Criticism in America,* a subject that has never been systematically studied.

JAMES H. HANFORD has published the following essays:

The arrangement and Dates of Milton's Sonnets. *Modern Philology,* January, 1921.

This article corrects and supplements a recent study of David H. Stevens by reëxamining the manuscript evidence for the order in which Milton composed certain of his minor poems. While a conclusive dating of the doubtful sonnets is not arrived at certain new facts of importance in the discussion with regard to the original form of the Cambridge Manuscript are conclusively established and the Italian sonnets are pretty clearly shown to belong not to the period of Milton's Italian journey but considerably earlier, at a time when Milton was addressing certain Latin poems similar in tone and subject matter to Diodati.

Milton and the Art of War. *Studies in Philology,* April, 1921.

A survey of Milton's works reveals the fact that the poet had made a careful study of the science of war as it was known in his day. The sources of his knowledge are shown to be purely theoretical—comprising

the classics, the authorities of the Renaissance and particularly an extensive English work of Milton's own day, entitled *Animadversions of Warre,* by Robert Ward. The last named work has not hitherto been discussed in its relation to Milton. In the course of the study the significance of the military element in Milton's thought and in the artistic structure of his poetry is made clear. Masson's assumption that Milton must have had actual experience in arms is shown to be unfounded.

The Chronology of Milton's Private Studies. *Publications of the Modern Language Association,* June, 1921.

The scope of the studies here published is described in the last number of "Research in Progress." The article represents an occupation of several years with the problem of analyzing the contents of Milton's manuscript note book on the basis of the handwriting in such a way as to show the order in which the reading represented by the notes was accomplished. A coherent plan of historical study is demonstrated to have been begun by Milton about 1635 and carried through approximately to the year 1644. Much light is thrown on the character of Milton's intellectual development and a basis is provided for further systematic study of his learned sources. The chronology of some of the Italian entries in the hands of various amanuenses suggests that Milton renewed his interest in Italian poetry in the years immediately preceding the composition of *Paradise Lost* and provides new material for the consideration of Italian influences in that work.

Milton and Ochino. *Modern Language Notes,* 1921.

A note calling attention to a hitherto undetected reference in Milton to the writings of the Italian reformer, Bernardino Ochino, to whom the poet has been supposed to be indebted for some of his ideas on divorce and on the nature of the Trinity.

Abstracts of theses submitted in June, 1921, for the degree of Master of Arts in the Department of English are appended:

A Study of the Chief Literary Magazines of the South, 1865-1880. By Raymond William Adams.

The material used for this paper consisted of those monthly and quarterly literary magazines published in the South between 1865 and 1880 of which nearly complete files were available; namely, *The Land We Love, The Richmond Eclectic, The New Eclectic, The Southern Magazine,* and *The Southern Review. Russell's Magazine,* of Charleston, South Carolina, though published before the Civil War, was included in the discussion of the background because of its great influence upon the later magazines. These magazines were studied in the light of their relation to the large amount of Southern writing immediately after 1880. Critical standards were found to have been advanced in the magazines by Paul H. Hayne,

George E. Summey, and Edward S. Gregory which determined the nature of the later Southern writing. Certain authors were found to have been discovered by the magazines, notably, Richard Malcolm Johnston, George Herbert Saas, and Joel Chandler Harris. Pecuniary assistance to authors was seen to have been impossible but, in providing a sympathetic reading public and in encouraging writers, the magazines laid deep foundations for the writing of the eighties which the nation regards as the real Southern literature. Finally, the paper attempts to show how the later Southern literature was influenced by the critics and editors of the South itself, rather than by the discovery of authors by Northern publishers as has hitherto been supposed.

The Ideal Commonwealth in the Renaissance Period. By John L. Aycock.

In the study of the sixteenth century examples of the ideal commonwealths two works not generally considered were introduced: Spenser's *Faerie Queene,* Book V, and Sidney's *Arcadia;* and the analogy between Plato's "men of gold" (perfect guardians) and Spenser's and Sidney's Ideal Governor was pointed out. Two other treatises, Elyot's *Governour* and Sir Humphrey Gilbert's *Queen Elizabeth's Academy,* dealing with the training of the Ideal Governor, were discussed. More's *Utopia* was studied as an attempt at social reform, embodying an idealistic and ethical conception of the State.

It was shown that the sixteenth century ideal commonwealths, considered together, summed up the five main things that had been brought out by Plato in his *Republic,* namely: (1) the ethical and social conception of the State; (2) the effort to attain Justice, which is the chief end of the State; (3) the education of perfect governors, looking towards a wise government; (4) the constant use of allegory to illustrate certain points; and (5) the ideal state based on actual conditions existing in the author's day.

In passing from the sixteenth to the seventeenth century ideal commonwealth, a marked change was observed. It was noted that practically every example within the period followed the Roman conception, being legalistic and constitutional. This change was explained by the interest in the struggle between the King and Parliament to gain control of affairs. A new consciousness of power, based on "natural right" and derived through Rome, sought expression in revolt against monarchy. The antagonism between King and Commons was illustrated, in the thesis, by an exposition of the political theories of James I in contrast to Francis Bacon's conception of the State, as seen in the *New Atlantis* and in certain of his essays and other works. Hobbes' *Leviathan* was shown to uphold James' views of monarchy ("divine right"); it uses the theory of "natural right" and "natural law" to show the absolute power of the king. Its chief note was seen to be realism, which characterizes all of the Seventeenth Century Ideal Commonwealths.

The writer showed that Harington's *Oceana* is the best example of the century's conception of the State. Here was found a plan for a formal "constitution," guaranteeing to each man his right to vote, to hold office, and to share in the privilege of property and government. Harington's treatise, it was shown, substitutes the power of the commons for the power of the monarch; *Oceana* is a scheme for the setting up of a constitutional government by Cromwell.

English Theories of the Epic between 1650 and 1725. By Agnes M. Clegg.

The primary problem considered in this paper has been to define the theory of the epic in England in the late 17th and early 18th centuries; to prove that the typical English doctrines, while reflecting many classical lines, show a pronounced degree of independence of fixed standards and formulated rules. The method used throughout is one of comparison and contrast. A set of epic tenets based, according to French criticism, on the "precepts" of Aristotle, has been used as a criterion. A brief review of epic theory is made, beginning with the principles of Aristotle, followed by the interpretations of Horace, with the later Italian and French modifications. Beginnings of dissent from classical models and European influence are noted in Spenser and Sidney. With Milton and his epic theories the point is made that *Paradise Lost* was not created according to the "rules" and therefore is not subject to them. Hobbes' and Davenant's discussion of *Gondibert* is the nearest approach in England to the pseudo-classic theory of the epic, yet even this shows traces of English independence. Dryden's epic theory, expressed in his prefaces, especially the *Apology for Heroic Poetry,* is decidedly independent and English in tone. Addison's judgment of the epic qualities of *Paradise Lost,* as given in the *Spectator* papers, in spite of its formalistic method, shows evidences of independence, both as to spirit and content of criticism. The conclusion is that epic theory in England has not developed along the lines laid down by former centuries, or by foreign critics, but has either disregarded them altogether or modified them to an appreciable degree.

Studies in Feminism in the *Spectator* and *Tatler*. By Albert Pettigrew Elliott.

The periodical essays of Addison and Steele are studied as documents in the history of the modern movement toward the emancipation of women and their authors are shown to have assumed in general a reform attitude far in advance of their time. While finding inherent weaknesses in the character of woman, they champion in general her equality with and in some respects her superiority to man. Socially and intellectually woman has not been allowed an opportunity for full development. The marriage relation demands a radical readjustment in her favor. With regard to the education of women, Addison and Steele offer many concrete suggestions and themselves participate in the task of enriching her intellectual life.

The introductory chapters trace the history of opinion regarding the position of woman, from the Middle Ages, illustrating an advance in Milton which prepares the way for the ideas of Addison and Steele.

The Relation of Spenser to Sidney. By Edwin S. Lindsey.

The purpose of the investigation is to ascertain the nature of the personal relations between Spenser and Sidney, and to estimate Spenser's literary debt to Sidney. Chapter I is a review of the scanty historical evidence. Spenser spent two years of his early manhood in contact with Sidney, who was his patron. Chapter II takes up the literary theories held by the two men, and the resemblances between the *Arcadia* and the *Faerie Queene*. Reformed versifying and the Areopagus are dismissed as of little weight. Close parallels are found in theories of the moral function of poetry, the supremacy of the epic, Neo-Platonic doctrines of love and beauty. The *Arcadia* and the *Faerie Queene* resemble each other in that both are heroic "poems," in the Elizabethan sense, written to show the virtues of the ideal courtier or gentleman. Both lack classical unity, are compounded of many elements, are episodic in structure and elaborate in diction.

Chapter III discusses the appearance of Sidney in the poetry of Spenser. The conventional tone of *Astrophel*, which some critics claim as proof of the insincerity of Spenser's affection for Sidney, is necessary because of the use in the poem of a classical story, the position of the poem in a series of conventional poems, and by Elizabethan literary customs. Therefore *Astrophel* proves little, and is best dismissed from the evidence. Sincere love and admiration for Sidney are expressed in the *Ruines of Time, Colin Clout*, and the *Dedicatory Sonnet* to the Countess of Pembroke. The brave courtier in *Mother Hubbard's Tale* is drawn from Sidney and shows Spenser's admiration for him.

The final point in the evidence that Spenser held Sidney in great admiration and affection is the fact that his greatest knight, Sir Calidore, is drawn from Sidney. Dr. P. W. Long's contention that Calidore represents the Earl of Essex, Spenser's last patron, is rejected, because all England still regarded Sidney as the ideal courtier. Sidney possesses all the qualities of the courtier: a strong, well-developed body, courage and ability in war, learning, contemplation, politeness and social polish, graceful and honorable conduct in love. Essex is more famous than Sidney as a warrior: but he possesses the other qualities of the courtier in a lesser degree than Sidney does. Dr. Long identifies Pastorella with Frances Walsingham, who married first Sidney, and afterwards Essex. But Pastorella is more probably identified with Stella, or Penelope Rich, Sidney's old love, to whom he wrote the *Astrophel and Stella*, a sonnet sequence. This identification makes it impossible for Calidore to represent Essex.

Colin's talk with Calidore about his lady is a reminiscence of the early days when Spenser was close to Sidney at Leicester House. The dance of the Three Graces with Colin's lady parallels an incident in the *Old Arcadia*, the version in which Sidney appears prominently.

Washington Irving's Interpretation of America. By Louisa Pressly Reid.

Contrary to the conventional view of Washington Irving, one finds in his writings continual evidence of his interpretation of America, of his ideas of the course to be followed and the evils to be shunned, and of a desire to do something to give the new nation through tradition, even through such seemingly inconsequential matter as a body of legend and story, a stability that should counteract the crudenesss of pioneer conditions and the dangers of political radicalism. His genuine respect for tradition and his conviction that true national progress is to be had only by building on a foundation laid long since in the past, afford a clue to Irving's thought about America. The essay makes certain additions to the study of Irving's sources in European folk-lore, and to the use by him of contemporary politics in the form of allegory.

Studies in the Theory of Translation in the Elizabethan Period. By Charles G. Smith.

The translations, prefaces, dedications, and critical essays of the Elizabethan period were studied with a view to finding out the main purposes of the translators and the relation of translation to humanism. The essay points out the wide interest in translation during the period, and also shows that the translators had certain fairly well-defined aims in turning the riches of the ancient and contemporary European languages into English. The following aims were discovered: 1. A patriotic aim: (a) To benefit the country politically; (b) To develop a national language and build up a national literature. 2. A moral and religious aim. 3. A professed humanistic aim. The material studied reveals the fact that all of these aims were humanistic in the true sense of that word. Taken together they constitute a many-sided purpose, which is the differentiating characteristic of the humanism of the time. Besides, the essay shows that translation played a great part in the growth of Renaissance ideals in the sixteenth century.

A Study of the Ideal Commonwealth in Modern Prose Fiction. By Joseph Felix Spainhour, Jr.

Ten representative utopian romances of the nineteenth century are analyzed and compared with a view to exhibiting, first, the artistic values and limitations of this type of fiction, second, the philosophic and doctrinal ideas embodied in it in modern times. It is demonstrated that (1) modern science is reflected in the utopian romance in matters of setting and method, but that none of the romances have a serious scientific purpose; (2) questions of government concern the writers very little, the discussion being primarily social, economic, and to a lesser degree, religious; (3) while there is no inherent reason why the "utopia" should not constitute an acceptable form of fiction, as a matter of fact the nineteenth century exem-

plars of the type are from the artistic viewpoint largely unsatisfactory. The writers have strained too much after realism and have neglected the subtler illusion which the form demands. They have paid too little attention to character and motive. Finally they have been over-burdened with propaganda.

DEPARTMENT OF GEOLOGY

Collier Cobb has been absent for the year on the Kenan Foundation studying shore line processes in relation to harbor development and harbor maintenance. His studies have been along both sides of the North Pacific, and around the Gulf of Mexico and the Caribbean Sea.

Joseph Hyde Pratt has in preparation a volume to be entitled *The Mineral Resources of North Carolina.*

This volume is being prepared for the North Carolina Geological and Economic Survey; and will contain a complete list of the minerals of North Carolina with descriptions of their occurrence, location, chemical and physical properties, and uses.

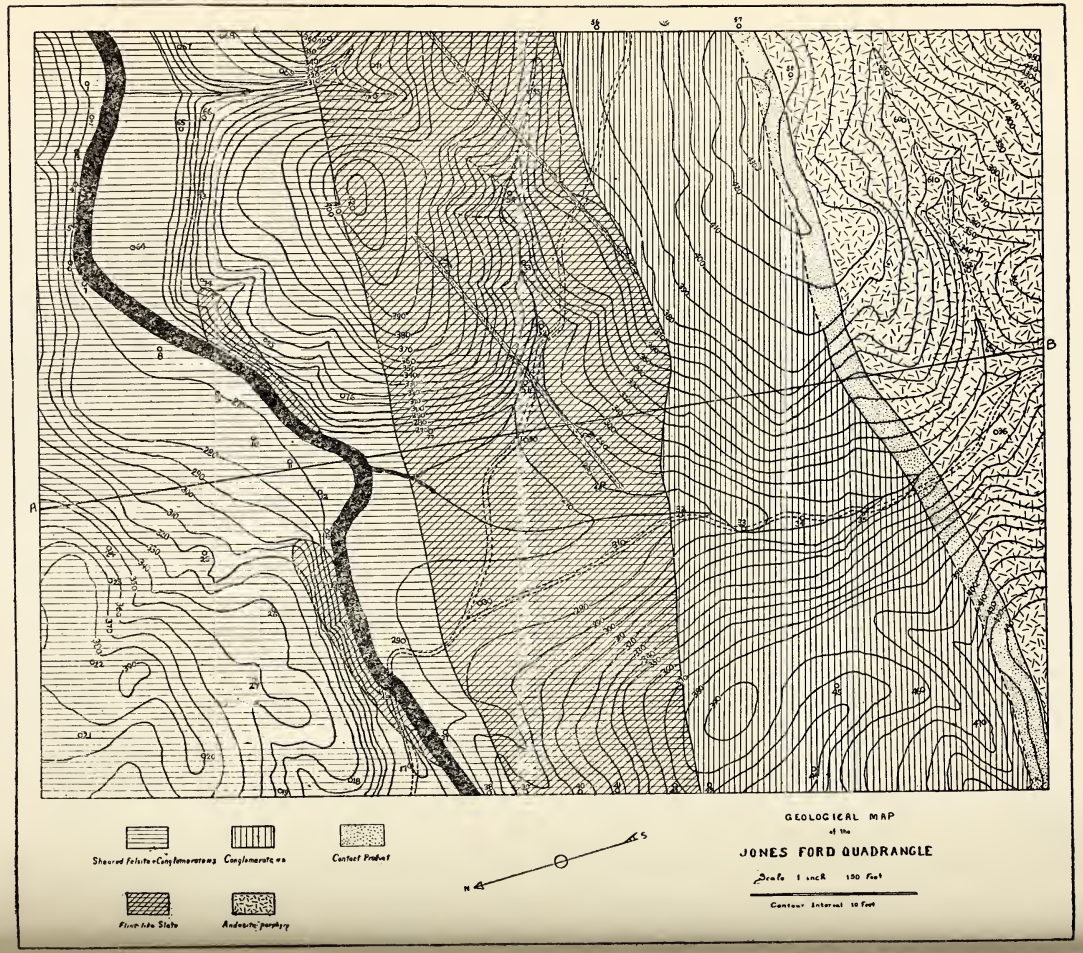
Geologic Map of North Carolina. By Joseph Hyde Pratt and W. F. Prouty.

This will be a detailed geologic map of the State showing all the formations that are known to occur in this State.

Natural Resources of North Carolina. By Joseph Hyde Pratt.

This volume will give a description of and discuss briefly the Natural Resources of North Carolina.

W. F. Prouty is completing a detailed geological report of Clay County, Ala. The report is accompanied by a large scale geological map. The area covered by the report includes the most productive flake graphite area in the United States. The results of several seasons' investigation of the stratigraphy of the Meso Silurian rocks in Maryland is soon to be published in the Silurian Report of the Maryland Geological Survey. At the present time Mr. Prouty is undertaking for the North Carolina Geological and Economic Survey a detailed study of the pegmatites of the state.


Sheared Felsite + Conglomerate
Conglomerate
Contact Product
Flint-like Slate
Andesitic porphyry
N
S
GEOLOGICAL MAP
of the
JONES FORD QUADRANGLE
Scale 1 inch 1320 Feet
Contour Interval 10 Feet

J. L. STUCKEY has been making a study of the sands, gravels and building stones of North Carolina during the past year. The results of his research will be published in an early bulletin of the N. C. Geol. and Econ. Survey.

W. B. JONES is investigating for the Alabama Geological Survey, the oil possibilities of southeastern Alabama.

The work of the graduate students has been concentrated on a small area about one and a half miles south of Chapel Hill. This area is one-half mile wide and five-sevenths of a mile long. A topographic map of this area has been completed on a scale of one inch equals 150 feet and a topographic interval of five feet and the geological formations have been mapped in by Messrs. J. S. Babb, W. H. Butt, S. B. Lee and J. B. Miller working together. The result of this coöperative work is here presented in map (figure 1).

The special fields of investigation of the three master students were taken from the area of the above map. Mr. Babb studied the Conglomerates, Mr. Butt the igneous rocks, and Mr. Lee the soils. Their conclusions in brief are as follows:

J. S. BABB. Conglomerates of Jones Ford Quadrangle:

1. The intrusion of the Chapel Hill igneous mass probably the immediate cause of the force that turned the rocks of the Purefoy's series on edge and metamorphosed them.

2. There is strong evidence of a fault along the small valley in the centre of the map.

There have been disturbances later than the upheaval by the Chapel Hill igneous mass. These have produced several minor and irregular sets of jointing.

4. Both conglomerates are metamorphosed sedimentary rocks.

5. All the rocks of the Purefoy's series were originally of sedimentary origin.

6. There is probably an unconformity between the Flint-Like Slates and Conglomerate No. 2.

7. The exact age of the formations cannot be told but they are doubtless the oldest series of rocks in the region.

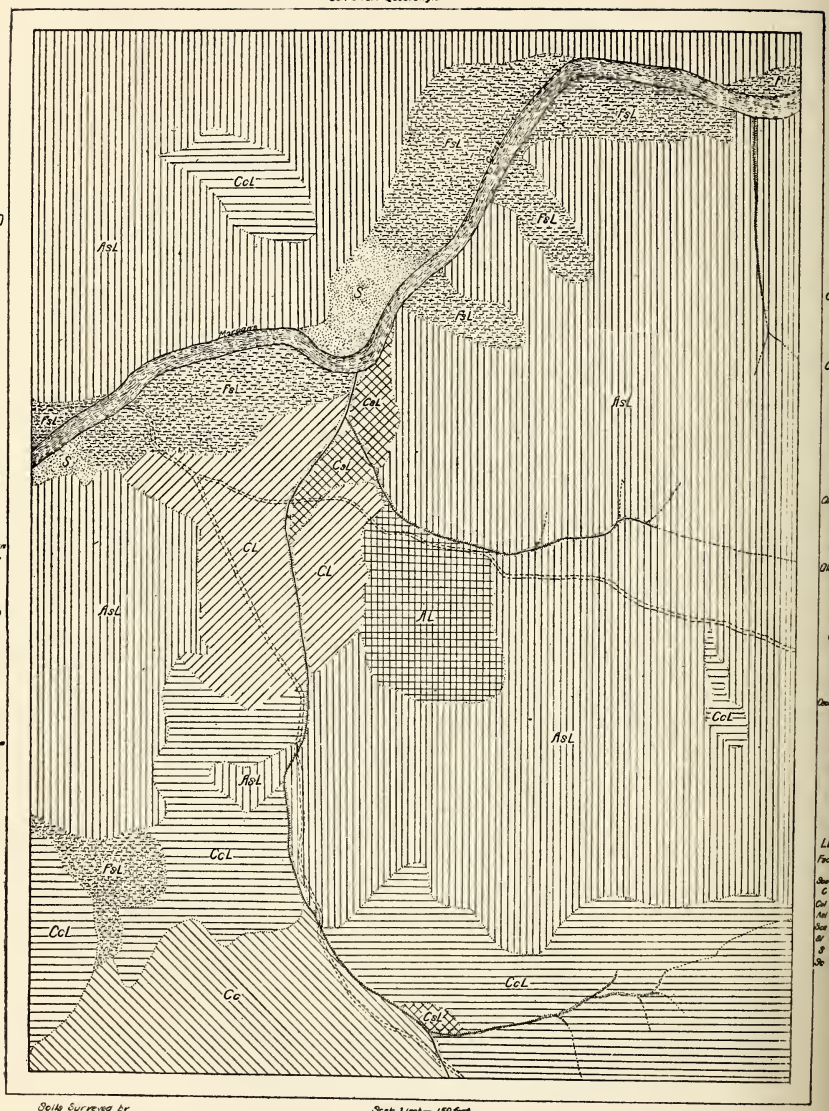
W. H. BUTT. Igneous Rocks of the Jones Ford Quadrangle:

1. The igneous mass of the Quadrangle is Andesite porphyry.

2. Convection currents have resulted in magmatic differentiation in the mass.

3. Flow structure is the result of this convective movement in the magma after it had become very viscous.

SOIL MAP
NORTH CAROLINA
Jones Ford Quadrangle



Soils Surveyed by
Samuel B. Lee
May 21 1951

Scale 1 inch = 150 feet

4. The intrusion is younger than the conglomerates and slates of the Purefoy's series, and older than the Triassic deposits in the basin to the east.

5. The dikes of the Quadrangle are of the same age and origin as the Andesite porphyry.

S. B. LEE. The Soils of the Jones Ford Quadrangle:

The soils of the Jones Ford area, as all the various soil types of the Piedmont Soil Province, are of residual origin, that is, formed through the processes of weathering and decay from the underlying rocks.

The only exception is the small area of alluvial soils found along the streams and here the soils are composed of fine material which has been washed down from adjoining uplands, carried and deposited along the streams at times of normal rainfall and freshets.

In many places on the slopes erosion has kept such a close pace with disintegration that the rotten rock or bed rock is exposed. The disintegration and weathering of the rocks by the slow but constant action for centuries of nature's agencies of decomposition and decay, such as rain, sunshine, freezing, thawing, vegetation and the like, have gradually broken down these rocks into very small particles, which mixed with organic and vegetable matter form the present soils.

The varied rocks of this area differ materially in their physical and chemical composition and their disintegration and subsequent processes of weathering have given rise to apparent differences in the resultant soils. These differences have justified the grouping of the soils into series based principally on the origin or character of the rock from which derived, color, structure and texture.

The two important factors which have governed soil differentiation in this area, then, have been the character of the original rocks and the effects of subsequent erosion. This is one of the most difficult problems connected with the forming of the Piedmont soils. Especially in the division of the Jones Ford area is much of the land peculiarly susceptible to erosion. This wasteful wash can be checked if not prevented by terracing the slopes, increasing the absorptive power of the soil by deeper plowing, by incorporating vegetable matter and by seeding the land to soil-binding grasses.

The soils of the Jones Ford Quadrangle (see soil map figure 2) fall naturally into two series,viz: Cecil series and Alamance series. From these series two classes are found, viz.: sedentary and transported.

These classes give rise to nine types, viz.:

1. Cecil sand.
2. Cecil fine sandy loam.
3. Cecil loam.
4. Cecil silt loam.
5. Cecil clay.
6. Cecil clay loam.
7. Alamance slate loam.
8. Alamance silt loam.
9. Meadow.

DEPARTMENT OF HISTORY AND GOVERNMENT

J. G. DE ROULHAC HAMILTON has published, through the North Carolina Historical Commission, the fourth and last volume of his edition of the *Ruffin Papers.* The series contains the letters and papers of Thomas Ruffin (1787-1870), chief justice of North Carolina for many years. He is also engaged in the editing for publication through the Historical Commission the diary and recollections of Randolph Shotwell under the title of *The Shotwell Papers.* In collaboration with Prof. Edgar W. Knight, of the Department of Education, he is engaged in an investigation of the problem of training for citizenship. A preliminary study of the problem, undertaken under the auspices of the education and recreation branch of the war plans division of the general staff of the army, was published in February by the War Department, under the title, *Education for Citizenship.*

H. McG. WAGSTAFF is editing the *Steele Papers* for the North Carolina Historical Commission. They will contain the papers of John Steele, which are to be found in the collections of the University of North Carolina and the North Carolina Historical Commission, and which throw much light on early national politics and on the history of North Carolina.

W. W. PIERSON has almost brought to completion his *Republican Form of Government in the United States, a Study of the "Guarantee" Clause of the Constitution.* He is also engaged in investigation of the following subjects: *The Political Theory of José Victorino Lastarria,* and *The Political Theory of Juan Bautista Alberdi.* He has recently published through the Institute of International Education a revised and greatly enlarged Syllabus of Hispanic-American History.

Abstracts of theses presented to the Department of History and Government for the degree of Master of Arts in June, 1921, are appended:

David Caldwell; A Study in Early County and State History. By Elsie Clegg.

The history of central and western North Carolina in colonial times presents a picture of the turbulent life of the frontier. Among the pioneers a few characters stand out. David Caldwell was the beacon light

of the central part of the province in those early days. A Scotch-Irish Presbyterian minister, he was the pastor of Buffalo and Alamance churches in Guilford County for over fifty years. He studied medicine and combined the services of physician with those of preacher. He early established a classical school. Here he performed his greatest work for the state. For over thirty years this "log college" in Guilford County served the state as an academy, a college, and a theological seminary. Among his pupils were five state governors, about fifty ministers, a large number of physicians, lawyers, judges and statesmen. One of the first settlers in the county, he knew his people personally and sympathized with them in the Revolution. He served as mediator between the people and Governor Tryon at the battle of Alamance and was present at the trials and executions at Hillsboro. In the Revolution he was a thorough whig and preached civil as well as religious liberty Sunday after Sunday. So zealous was he in the American cause that Cornwallis offered a reward of 200 pounds for his capture. He was elected to represent Guilford County in the constitutional convention of 1776 and it is believed that he was the author of the thirty-first and thirty-second articles of the consitution, which provided for a religious test for office holders and excluded therefrom all ministers in active pastoral duties. Again in 1788 he represented Guilford County in the Hillsboro convention, being one of the leaders of the majority who opposed ratification of the Federal Constitution. When the University went into operation, in 1775, he was asked to become its president. He refused, preferring to remain in the smaller sphere where, if the honor was not so great the opportunity for service was greater. Dr. Caldwell's life is inextricably bound up with the history of the county and the state. His influence was always for liberty, enlightened religion and education.

The Political Theory of Alexander Hamilton. By Keener C. Frazer.

A treatment of the political theory of Alexander Hamilton must be concerned, necessarily, with evidences objective, rather than those which bespeak the possession of a clear system of political philosophy. He was not one of "those political doctors whose sagacity disdains experimental wisdom."

In his views of popular government, Alexander Hamilton frankly professed a distrust of the political genius of the "people." These he at one time characterized as a great "beast," unintelligent and violent. His position in this regard was nowhere more clearly defined than in his views upon institutions of government. He regarded the English form as the best then existent and regretted the impracticability of such in America. As an integral feature of his philosophy of government, Hamilton urged the necessity of maintaining a strong army and powerful navy. This idea probably suggested to him certain plans of territorial expansion looking definitely toward South America. These were intimately connected with the projects of the South American agitator, Francisco de Miranda. The

genius of Hamilton was administrative and it was in this field that his most distinguished contribution to American political thought was made.

Recent Diplomatic Relations between the United States and Nicaragua. By Leo DeWitte Martin.

To provide a background the geographical features of the country are examined, as well as the characteristics of the population which have been potent in the shaping of their history. The part played by such social and political qualities as *localismo, personalismo,* and *caudillism* are traced. The history during the nineteenth century is reviewed briefly, showing the conflicts between Liberals and Conservatives; attempts and failures at union, and the reasons for the latter. Then follows a brief account of the adventures of William Walker, who is treated as a soldier of fortune, an arch filibuster, and not, as is often alleged, as an unscrupulous politician scheming to overthrow the governments of Central America, and annex that area to the slave-holding states of the South.

The expanding interests and the new policy of the United States in the Caribbean area are traced, showing how it led to the Washington Conference of 1907, where, as on several occasions before, the United States and Mexico coöperated in bringing about a conference of Central American statesmen to formulate plans and agreements for the political, economic, and social regeneration of Central America; the most ambitious undertaking being the Central American Court of Justice, to which the republic bound themselves to submit all their differences. The fall of the Nicaraguan Liberal régime was brought about in 1909-10 due to pressure exerted by the United States. When the Conservative leaders failed to agree among themselves, the United States intervened and established a quasi-protectorate. Since then the Conservative régime has been kept in power by the armed forces of the United States. The internal and external debts of Nicaragua have been adjusted and put on a payable basis under the supervision of American bankers on the basis of a customs-receivership administration under contracts between the bankers and the Republic. Nicaragua is now a land of order and progress, her internal and external debts are being rapidly paid, and her currency is on a gold basis. There is no longer danger in this vital quarter that intervention by a foreign power to redress its grievances in a bankrupt, revolution-infested country might assume a political aspect. Many Nicaraguans believe that order and solvency were procured by a sacrifice of sovereignity, and so violently oppose the enforced tutelage.

The Anglo-American relations involved in the Mosquito Coast question and the Clayton-Bulwer treaty are traced briefly, showing a gradual decline of British interests in Nicaragua, and a steady increase of American interests, finally culminating in a complete withdrawal of the British from that area. The treaty of 1913 embodying the principles of the Platt Amendment failed, but in 1914 a second treaty was concluded with Nicaragua which gave the United States a canal option and a naval base on

both coasts of Nicaragua. Protests against the treaty having been made by Salvador and Costa Rica, the treaty was brought before the Central American Court of Justice, which handed down decisions in favor of the plaintiffs. Both the United States and Nicaragua have ignored these decisions and the court is defunct, discredited by the very nation which sponsored it. All Central America is suspicious of the motives of the United States. The whole situation presents the question of what shall be the policy of the United States in her dealings with the small, backward states which lie at her doors. Is the Nicaraguan policy that of "dollar diplomacy?"

DEPARTMENT OF LATIN

The Revelation of Aeneas' Mission. A paper read before The Southern Classical Association. By George Howe.

The mission of Aeneas to establish in Latium a people from whom Rome should take its origin is the central thread binding together the several parts of the Aeneid. While this has long been recognized, scant notice has been given to Virgil's method of revealing the mission to Aeneas. This was no easy task for the poet, since Aeneas at the outset was ignorant of his fated task, and in need of constant guidance and instruction. By passing over the point in silence the poet wisely avoids presenting Aeneas to his reader as an automaton. For Aeneas in the course of his movements he simply supplies necessary guidance as occasion arises.

In the first book the reader learns, and from statements of Aeneas himself, that the hero is now fully informed of the work he is to do. But this is after the landing in Africa at a time when Aeneas was well on his way to Italy. It is then in the second and third books, which contain Aeneas' own story of his adventures following the fall of Troy, that the poet's method of revealing the mission is developed.

A vision of Hector's spirit first presents to Aeneas his mission, though not in detail, but Aeneas does not at all grasp its significance, for he returns to the fight. Then the warning of Venus leads him home to protect his family. In the scene that follows it becomes clear that Hector's word meant to him only the possibility of escape. In the flight from the city the ghost of Creusa gives the second revelation in more definite form, but at the time its meaning to him is that she is dead and

that he must save his followers. At the first then Aeneas understands no more than that he must flee over seas and somewhere build a settlement.

This lack of comprehension on Aeneas' part has been used as evidence of the unfinished state of the Aeneid. But when it is considered that the revelations were delivered in the midst of most confusing events requiring Aeneas' entire attention, the line of argument seems untenable.

The third book is especially one of revelation. First comes the warning to leave Thrace. At Delos the hero consults Apollo who advises him to seek the land which was his ancient mother. To Anchises this means Crete. But there, when they are afflicted by pestilence, the Penates in a dream warn Aeneas to seek Hesperia, which they also term Italy. Aeneas is now aware of the land he must reach, but not yet fully aware of a mission. Calaeno, the harpy, adds details; but it is from Helenus that at last he gets complete instruction. And only then does he completely understand his mission.

The method of Virgil is then to reveal the mission gradually and cumulatively, beginning with the words of Hector's ghost and ending with the explicit directions given by Helenus.

G. A. Harrer has published the following article:

A Thirteenth Century Fragment of Justinian's Digest. *Studies in Philology,* xvii, 4.

The fragment was edited in collaboration with Mr. J. S. Moffat. Historical and palaeographical evidence proved that the manuscript was copied in the thirteenth century and that it is among the older of the Vulgate class. The editors are trying to get additional evidence concerning its history.

Mr. Harrer is preparing papers on Precedence in Roman Law, on a chronological problem of the reign of Septimius Severus, and on recently discovered inscriptions.

DEPARTMENT OF MATHEMATICS

Archibald Henderson is continuing certain work in integral equations begun some years ago in Cambridge and Berlin, and also researches in the foundations of geometry. Some of this work is expected to reach publication within the coming year.

John W. Lasley is continuing his studies in projective differential geometry. He is engaged in preparing for immediate publication his recent researches in that field. The work will be entitled "Some Special Cases of the Flecnode Transformation of Ruled Surfaces." The process of obtaining the flecnode surface of a ruled surface leads to the consideration of a suite of surfaces, called the flecnode suite. Questions arise as to the cases in which this suite terminates, or returns into itself. It is the purpose of this investigation to study some of these questions. It is found that the suite terminates with its first transform, if, and only if, the given ruled surface has a straight line directrix. In case the termination occurs with the second transform, both branches of the flecnode curve on the given ruled surface may be obtained without integration. The suite is of period two, if, and only if, the flecnode curve meets every generator in two coincident points. The flecnode suite cannot be of period three, nor of period four. The conditions for termination and for periodicity considered are expressed in terms of the invariants of the differential equations which define the given ruled surface.

Mr. Lasley has recently published the following articles:

A Theorem on Double Points in Involution. *Journal of the Elisha Mitchell Scientific Society,* 1921.

The notions of involutions, their double points, and the common corresponding pairs of two involutions are set forth analytically with illustrations. It is shown to what extent an involution may be determined by pairs of corresponding points. On these preliminary notions the following general theorem is established: the common corresponding points in two involutions are identical with the pair of double points in the involution determined by the double points of the two given involutions.

Some Elementary Vector Equations. *Journal of the Elisha Mitchell Scientific Society,* xxxii, 4.

In the analytic geometry of the complex plane a vector and its conjugate may be considered as coördinates analogous to the ordinary coordinates of Descartes. In terms of these coördinates the vector equations for the straight line, the circle, the ellipse and the hyperbola are derived. A way to pass from one system of coördinates to the other is illustrated by special cases.

A Note on Diophantine Problems. *The High School Journal,* iv, 5.

A type of problem in Diophantine Analysis is discussed in some detail. The more important general theorems relating to this type of problem are listed. Something of the historical background of the problem is pointed out.

DEPARTMENT OF PHARMACOLOGY

WILLIAM DEB. MACNIDER published the following articles:

On the Elimination of Phenolsulphonepthalein in Acute Mercuric Chloride Intoxications. *Proc. Soc. Expr. Biol. and Med.,* xviii, 73, 1920.

When normal dogs are given mercuric chloride in the dose of 4 mgs. per kilogram there develops a well-marked and constant diuresis. The mercury diuresis is not solely dependent upon the action of the mercury on the kidney during the elimination, for such a diuretic effect may be obtained when the urine is free from mercury. In the early stages of an intoxication from such small quantities of mercury there is further evidence of its diuretic effect which is shown by an increase in the elimination of phenolsulphonepthalein. Prior to or associated with the appearance of albumin and casts in urine, there occurs a reduction in the reserve alkali not primarily a retention phenomenon, dependent upon an injury to the kidney for at the time of the reduction in the alkali reserve of the blood there is evidence of an increase in the functional capacity of the kidney, as is shown by an increase in the amount of urine formed and by the ability of the kidney to eliminate phenolsulphonepthalein. Furthermore, at this stage of the mercury intoxication, the kidney shows no evidence of injury, but does show on the contrary a convoluted tubule epithelium with nuclear and cytoplasmic changes indicative of functionally active state. At this early stage of the intoxication by mercuric chloride there occurs a reduction in blood urea. This decrease in blood urea has been associated with the development of degenerative changes of the liver, which first make their appearance in the periphery of the liver lobule. Associated with such changes in the liver and prior to the development of the kidney injury, there occurs a reduction in the alkali reserve of the blood.

On the Stability of the Acid Base Equilibrium of the Blood in Normal and in Naturally Nephropathic Animals. *Science, N. S.*, liii, 1363, p. 141, February, 1921.

The experiments indicate that the reserve alkali of the blood in certain naturally nephropathic animals may be maintained by the animals within the range of normality. Such an observation is, however, no index of the ability of such an animal to maintain a normal acid base equilibrium of the blood when the stability of the mechanism which regulates this mechanism is subjected to the strain of handling either an acid or an alkali. When a normal animal receives intravenously an acid or an alkaline solution there occurs a disturbance in the acid base equilibrium of the blood, which is temporary and which is rapidly followed by a reëstablishment of the animal's normal equilibrium. When, however, a naturally nephropathic animal is subjected to a similar disturbance in the acid base equilibrium of its blood the lack of stability on the part of the mechanism which maintains this stability is shown by the facts that the acid or alkaline solution induces a greater degree of variation from the animal's normal equilibrium and that the animal is unable to reëstablish within the time limit allowed the normal animal a return of the blood to a normal acid base equilibrium.

A Preliminary Paper on the Relation Between the Amount of Stainable Lipoid Material in the Renal Epithelium and the Susceptibility of the Kidney to the Toxic Effect of the General Anaesthetics. *Jour. of Phar. and Expr. Therap.*, xvii, 4, p. 289, 1921.

The paper is concerned with a study of certain differences in the amount and location of stainable lipoid material, which makes its appearance in the renal epithelium of animals of different age periods. The paper is furthermore concerned with the relationship which appears to exist between such material and the susceptibility of animals in these age periods to the general anaesthetics. In normal animals of different age periods there has been demonstrated a larger amount of stainable lipoid material in the kidneys of old dogs than in the kidneys of puppies and young dogs. Furthermore, the distribution of such material varies with the age of the animal. In puppies such lipoid material is confined to the cells of the loops of Henle. In very old animals stainable lipoid material can be demonstrated in very small amount in the convoluted tubule epithelium. When normal animals of different age periods are anaesthetized by either chloroform or ether, there is found to exist a definite relationship between the toxicity of the anaesthetic for the renal epithelium and the age of the animal. These anaesthetics are more toxic for the kidneys of old animals than they are for the kidneys of puppies and young animals. This variation in toxicity is expressed histologically by more extensive degenerative

changes in the kidneys of old animals and by a more marked decrease in the functional response in the kidneys of such animals. Chloroform has been found to be more toxic for the kidneys of both old and young normal animals than ether. The former anaesthetic induces more evidence of epithelial degeneration in the kidney. When kidney tissue of normal animals of different age periods that have been anaesthetized by chloroform or ether is stained for lipoid material and studied histologically, there has been found to occur a greater accumulation of such material in the kidneys of those animals anaesthetized by chloroform than in the kidneys of the animals anaesthetized by ether. The amount of stainable lipoid material in the renal epithelium of animals of different age periods appears to determine the susceptibility of the kidney to the anaesthetic, and the anaesthetic employed plus the age of the animal furthermore determines the amount of such material which accumulates in the epithelium during a period of anaesthesia. When naturally nephropathic animals are killed without the use of an anaesthetic and the kidneys studied histologically, the animals have been found to have a glomerulo-nephropathy, with but slight histological evidence of epithelial injury. When fresh tissue from such kidneys is stained for lipoid material the epithelium of the loops of Henle and the convoluted tubule epithelium is found to contain stainable lipoid material, which is much in excess of that which can be demonstrated in the epithelium of normal animals. A severe injury to the glomerulus is apparently first expressed, in so far as the renal epithelium is concerned, by such a disturbance in the metabolism of these cells that the lipoid material accumulates far in excess of the amount normal for the cells. When such naturally nephropathic animals are anaesthetized by chloroform or ether they show an increased susceptibility to the anaesthetic which is characterized locally in the kidney by a great increase in the amount of stainable lipoid material and by the development of marked degenerative changes in the tubular epithelium. The severity of the degenerative changes and the accumulation of stainable lipoid material are far in excess of similar changes induced in the renal epithelium of normal animals by the same anaesthetics during a period of anaesthesia of the same duration. The general toxic effect of ether and chloroform in both normal and naturally nephropathic animals is shown by a disturbance in the acid base equilibrium of the blood. The depletion in the alkali reserve of the blood which follows the use of these anaesthetics is more marked in old animals than in young animals. Furthermore, the use of chloroform effects a greater disturbance in the acid base equilibrium of the blood in animals of different age periods than does ether. Finally, the naturally nephropathic animals show even a greater depletion in the alkali reserve of the blood following the use of the anaesthetics than do the very old normal animals. In conclusion, the results of the investigation indicate a definite relationship between the amount of stainable lipoid material in the renal epithelium of both normal and naturally nephropathic animals, and the susceptibility of this epithelium to the toxic effect of both ether and chloroform.

The Changes Induced in the Kidney When an Acute Injury is Superimposed on a Chronic Glomerulo Nephropathy: A Functional and Pathological Study. *Southern Medical Journal,* xiv, p. 357, May, 1921.

The existence of a chronic glomerulo nephropathy renders the kidneys extremely sensitive to such nephrotoxic agents as ether, chloroform, uranium nitrate and mercuric chloride. The acute injury induced by such agents is very largely confined to the tubular epithelium. Associated with the development of the acute injury there occurs a disturbance in the acid base equilibrium of the blood which may occur prior to the decrease in renal function as is indicated by the ability of the kidney to eliminate phenolsulphonephthalein. As the tubular injury progresses there is a further reduction in the alkali reserve of the blood, which is a retention phenomenon. The tubular injury is furthermore characterized by a retention of blood urea and creatinine and by a marked increase in the output in the urine of albumin casts. Such animals become rapidly anuric and die of air hunger in convulsions or gradually develop coma. If the animals with a chronic glomerulo nephropathy be given prior to the acutely acting nephrotoxic agents solutions of sodium bicarbonate the renal epithelium is protected against the acute injury.

DEPARTMENT OF PHYSICS

O. Stuhlman, Jr., has published the following articles:

On the Photoelectric Long Wave—Length Limit of Platinum and Silver. *Physical Review,* 15, 549, 1920.

In a previous article it was shown that the photoelectric current coming from a transparent metallic wedge, when the metal side is turned away from the light, was a function of the thickness exposed and of the wave-length of the incident light energy. The curves for the metals examined have this in common; all make finite angles with the abscissa. The tangent to the curves at the origin are more inclined to the abscissa than the tangent at any other point. So that the photoelectric current occurring there, for any frequency, bears a definite ratio to the mass per square centimeter of the metal exposed. The slopes at the origin are a measure of the photoelectric current given off by a metallic thickness comparable to the diameter of one molecule. Hence plotting these slopes as a function of the wave-length should give a curve which plunges into the axis of wave-lengths at a point where photoelectric action ceases.

The photoelectric long wave-length limits for the above two metals thus determined were: Platinum, $\lambda = 284\ \mu\mu$, silver $\lambda = 325\ \mu\mu$.

Research in Progress on the Complete Photoelectric Emission of a Metal as a Function of the Depth of Penetration of

the Incident Light Energy. The experimental work for this problem has been completed and it will show that superimposed on the usual primary photoelectric effect is a "secondary effect" which has been neglected to date. The complete primary effect follows the relation $I = c\, b \frac{t}{m + nt}$, where I is the photo-electric current and t the thickness of the metal under investigation. C, m and n are constants. The "secondary effect" is composed of two phenomena, an emission of electrons following an exponential law and a subsequent absorption following an exponential law as yet undetermined. From this it is hoped to show that in secondary emission the number of secondary electrons may exceed the number of primary by as much as ten to one. This may throw some light on the structure of the outer electron ring in the metals under investigation.

Research in progress but not completed. W. F. Allston, D. A. Wells and O. Stuhlman, Jr. On "Negative Resistance" Thermionic Vacuum Tubes.

DEPARTMENT OF PSYCHOLOGY

E. W. ATKINS: The Quadruple Choice Applied to White Rats.

An attempt was made to place the white rat in the rating scale suggested by Hamilton for various animals. His method was followed identically. Each subject was given 100 trials in passing through one of four doors unlocked in irregular order. An analysis was made of these trials. They were first divided into classified and unclassified reactions; and the classified reactions then distributed on the basis of their efficiency in locating the unlocked door. The results obtained indicate that the rat uses a method of search that is similar to that employed by dogs, cats, and monkeys, and superior to that of the horse.

E. W. ATKINS and P. D. PRIEST: Effects of One- and Two-Hand Practice on Right-Handedness and Rate.

By use of two telegraph keys an effort was made to find the relation existing between the two hands when working on the tapping experiment. Three questions were held in mind during the experiment. First, what is the effect of practice on the index of right-handedness? Second, what is the absolute effect of one hand upon the other when both were working together? Third, in what form does this effect show itself most clearly? The subjects were given from 13 to 20 trials each. Records were made of the

tapping of each hand when working separately and when working together. Results indicated that the index of right-handedness is smaller when both hands are working together than when separately; that the total output of each hand under the former condition is less than it is when under the latter (for right, 2%, left, 3%); that each hand improves under both conditions; and that the greatest improvement is in the case of the left hand when working with the right.

W. D. Glenn and J. F. Dashiell: Reëxamination of the Reactions of a Composite Social Group to Intelligence Tests.

In 1916-17 Chase and Carpenter tested children in the school of Chapel Hill by the Stanford Revision of the Binet Tests. The results obtained showed three clearly defined levels of response to the tests by children of different social status (country, town, and faculty). The present experiment was designed to check the results obtained at that time by repeating the identical tests on other children of the three groups four years later. Further, to check the possibility that opportunity and experience might have been a factor in the found differences, six performance (Pinter and Paterson) tests, not involving any use of language in any way, were added. In both the present series of tests the results paralleled closely the findings of Chase and Carpenter: the country group showed a median IQ distinctly below that of the town group, and the latter a median IQ distinctly below that of the faculty group. The agreements between tests given four years apart, and between language and non-language tests, support the conclusions drawn four years ago; *i.e.*, that the community from which this school draws its pupils is divided by some influence or influences into three intelligence strata coinciding with the social strata of the individuals studied. They also agree with studies made elsewhere on the correlation between innate mental capacity and social class.

J. F. Dashiell, W. H. Hosea and A. C. Norfleet: The Relation between Number of Blind Alleys and Total Maze Difficulty.

When all other factors are constant will the difficulty of a maze increase in direct proportion to the number of blind alleys offered? White rats were used as subjects; and four mazes were built, all having true-pathways identical both as to length and as to turns, the differences between the mazes being only in the number of blind alleys opening on these true-pathways. Maze A contained 2 blind alleys; B, 4; C, 6; D, 8. The rats were given these maze problems to solve in the usual manner, and a record kept of time and errors. The averages of errors per rat in the crucial trials were found to be: Maze A, 0.9; B, 2.1; C, 2.5; D, 3.6. Thus in three of the mazes the relation is the same for maze difficulty as for number of alleys; the exception of Maze B probably being due to the

substituting of a rat from a new stock to replace an injured one. Further work is needed to check this general finding; and this is being planned for many more rats and for human subjects.

J. F. DASHIELL and KATHERINE BATTS: A Preliminary Study of the Development of Drawing Ability.

An accurate method of measuring the actual improvement in drawing ability with age or training should be based upon two principles, hitherto not followed: the subject matter of the drawings should be identical for the different steps of the scale; the particular drawings should be evaluated not by general impression but by analysis of points. Six drawing subjects were assigned to 193 children and their work analyzed. Two of these subjects were found to be fairly differentiating, *i.e.*, capable of analysis in terms of points of technique, these points showing clear changes with age. The possibility of such a scale is thus demonstrated; the needs are in its amplification to include more drawing subjects, and in its application to many hundreds of children to establish norms.

J. F. DASHIELL, S. B. TEU, and BAILEY PATRICK: Personal Traits and Vocational Fitness.

Four teachers of each of five professional schools of the University were asked to check from a list of character traits culled from books on vocational guidance those particular traits most essential for their respective vocations. Statistical treatment of the results showed little differentiation between the different professions, and little agreement between judges of any one profession. A complementary study showed children and adults are clearly unable to judge either themselves or each other reliably in terms of various personal traits. The two studies together definitely challenge the use of such general-character-trait methods in vocational guidance.

Abstract of a thesis for the degree of Master of Arts is appended:

The White Rat's Reaction to Multiple Stimuli in Temporal Order. By Ernest Willie Atkins.

In the experiment here reported an effort was made to see if the white rat could learn to react to a situation whose solution could be made in terms of time only. The method used consisted of having the rats go to one of four doors, three of which were lighted in irregular order on each trial. For example, one group was to go to the first of the lighted doors, another group to the second lighted door, and still another to the third or last of the lighted doors.

Negative results were obtained because of the formation of position habits. The rats formed the habit of going to all of the doors in a certain order until the right one was found. Since the only stimulus used was food, this was a possible method of response for them.

These position habits resembled those formed by other animals used in a study of the methods of search employed. As far as the results obtained were comparable with those obtained in the experiment referred to, it seems that the rat uses a method of search similar to that used by the dogs and monkeys and more efficient than that used by the cats.

DEPARTMENT OF ROMANCE LANGUAGES

William Morton Dey has spent the year abroad as research professor on the Kenan Foundation. In part, he has been engaged in the preparation of a text-book on phonetics. Aside from this he has been making a study of the *Poèmes Philosophiques* of Alfred de Vigny, with the expectation of preparing a critical edition of these poems. He has also been interested in some recent developments of the Don Juan legend, particularly in Rostand and Bataille.

Oliver Towles is continuing a study of Phillippe de Commynes and of French literature in the first half of the sixteenth century. The summer of 1921 he is spending abroad in continuations of these studies.

Sturgis E. Leavitt is engaged in arranging bibliographical material collected by him during the year 1919-20. Granted leave of absence in order to take advantage of a Sheldon Traveling Fellowship awarded by Harvard University, he made extensive investigations in the libraries of Peru, Bolivia, Chile, Argentina and Uruguay. The results of these investigations will take the following form:

A bibliography of Peruvian literature, 1821-1919. To appear in the *Romanic Review.*

This bibliography is intended to supplement material now available in this country, especially Coester's *Literary History of Spanish America.* It includes works actually consulted in the library of the University of San Marcos, the Nacional Library and the private collection of Señor Javier Pardo y Ugarteche, Rector of the University. It makes no claim to completeness except that of including works actually in these libraries in 1919. From the list are omitted books of a purely scientific nature; mention only being made of history, biography, essays, epistolary correspondence, prose fiction and poetry.

A bibliography of Bolivian literature. To appear in the *Romanic Review.*

A bibliography collected in the Municipal Library of La Paz and that of the eminent Bolivian poet, Señor Rosendo Villalobos. Like the above study this includes history, biography, essays, epistolary correspondence, prose fiction and poetry.

Chilean literature. A bibliography of literary criticism, biography and literary controversy.

This study, in addition to the usual bibliographic description of books, will contain notes indicating the content or scope of the works mentioned. Magazine articles are also included as well as the publications of the most important newspaper critics, especially those of Romulo Mandiola, Pedro Nolasco Cruz, Ricardo Davila Silva and Emilio Vaisse (Omer Emeth).

Argentine literature. A bibliography of literary criticism, biography and literary controversy.

On account of the extensive material this compilation will be limited to books and magazine articles with extensive notes on the content of each book. It will include not only works of Argentine writers but the publications of authors of other nationalities resident in Argentina.

Uruguayan literature. A bibliography of literary criticism, biography and literary controversy.

Similar in scope to the above.

HOWARD R. HUSE presented a paper before the Philological Club on the cult for English literature in France in the eighteenth century. In this paper he related the subject to the problem of the origin of the romantic movement in France. Previous to the eighteenth century, France was, in general, unaware that there was such a thing as English literature. The acquaintance grew gradually, largely on account of the work of the Huguenot refugees. The taste for English literature once naturalized, the cult grew to astounding proportions. The paper indicates the cause and extent of this vogue, especially for such authors as Pope, Addison, Richardson, Fielding, the poets of melancholy, and Ossian, and the influence of some of them in helping to destroy the power of the French classical tradition. Mr. Huse has also continued his work on Pierre Bayle as a precursor of Voltaire. His thesis is that the move-

ment of negative and skeptical thought which began in Italy with the natural philosophers, and which grew throughout the Italian and French Renaissance, was completed on the purely intellectual side by Bayle toward the end of the seventeenth century. Voltaire and the Encyclopedistes contributed little new either in thought or method, but were the effective propagandists of the ideas already forged. Bayle's place in this movement is less well known because of the formidable nature of his heavy volumes in which he was obliged to disguise his dangerous doctrine in order to save his life. Like Rabelais, Bayle was a heretic even to the stake, *exclusively.*

DEPARTMENT OF RURAL SOCIAL SCIENCE

The main researches of the year have been: (1) Twenty-seven Studies in State Reconstruction, given to the public in the *North Carolina Club Year Book,* 1919-1920. (2) Fifteen investigations of North Carolina, urban and industrial. These studies will be edited for the printers in the early fall. (3) *Halifax County, Economic and Social,* by Sidney B. Allen and R. S. Travis, and *Beaufort County Economic and Social,* by the Beaufort County Club. The first of the bulletins has gone to the public and the second is still on the press.

DEPARTMENT OF SOCIOLOGY

Howard W. Odum has published, through the University Extension Division, two manuals:

Constructive Ventures in Government has for its purposes, among others, to meet the wishes of those women and women's clubs who have requested coöperation and suggestions in the new and constructive ventures of government; to emphasize a citizenship and government based on the ideals of social service and achievement; to magnify a training for citizenship based on knowledge and first-hand materials for the study of government; to contribute to the growing meaning of community and the powers, obligations and opportunities of local

government; to emphasize the companionable nature of both the study of and participation in government.

In addition to these general purposes, the manual emphasizes, in its form and content, the importance of *active citizenship,* and provides numerous projects for the enactment of the principles discussed. It is also an attempt to test a certain sort of popular technique as it applies to the woman voter, since no such technique of approach has yet been worked out.

Community and Government is a special edition of the same manual, making its application to high schools, to students in normal schools, and for the use of teachers and school officials wherever adapted to their purposes. A chapter on "The Meaning of Community" is added and some new classifications included. *Community and Government* is being almost entirely rewritten and enlarged with a view to its publication at an early date as a text-book in one of the special series.

Mr. Odum is continuing his study of *The Organization and Administration of Public Welfare* in the United States. The study will be divided into two parts: The first is a general basis showing the relation of the technique of public welfare to democracy; the second consists of researches into the history and status of systems of public welfare in this country. In addition to these studies, special publications with reference to public welfare in North Carolina are planned.

Mr. Odum will continue the study of the small town, especially as it relates to the work being done for the Bureau of Municipal Information and Research for the University Extension Division, with the first effort being a National Regional Conference on Small Town and County Administration in September at Chapel Hill. The National Municipal League and the North Carolina Municipal Association will coöperate.

J. F. Steiner completed a study of Education for Social Work which was published during 1921 by the University of Chicago Press. This book represents the first systematic effort to study the development of training schools of social work and evaluate the methods employed in this field of professional education. The material was secured by personal visits to the educational institutions offering professional training in this field and by

reference to their published reports and bulletins. The early portion of the book contains a historical resumé of the origin of the first training schools, the efforts made to place them on a graduate basis, and the gradual tendency of universities to take over the work of these professional schools. Among the topics discussed are the proper basis of education for social work, technical courses of instruction, the case method of teaching, the place of field work in the curriculum, the social work laboratory, the social work clinic, and methods of training for rural social work. The author takes the position that education for social work is a university task which should be placed on the same basis as the work of other professional schools and carried on by means of a thorough course of study in the social sciences accompanied by its appropriate field work practice.

Education for Social Work: Historical Development of Training Schools. *American Journal of Sociology,* January, 1921.

Education for Social Work: The Curriculum and Methods of Instruction. *American Journal of Sociology,* March, 1921.

Education for Social Work: The Place of Field Work in Training. *American Journal of Sociology,* May, 1921.

Some factors involved in minimizing race friction on the Pacific Coast. *Annals of the American Academy of Political and Social Science,* January, 1921.

Our Oriental immigration problem strikes much deeper than the matter of social assimilation. The fundamental difficulty is a difference of color and physical characteristics so marked that the Orientals cannot merge themselves unnoticed into American life. Public sentiment opposes intermarriage. Assimilation therefore can never be completed and the Orientals must maintain a separate racial existence. Under such circumstances racial competition is bound to be keen and the success of the Orientals in economic life will increase rather than allay the prejudice which immigrants must always face during their period of adjustment. A race problem growing out of the intermingling of races unlike in color and physical characteristics is one that has never yet been satisfactorily solved. Common prudence demands that suitable measures be kept in force to prevent Oriental immigration. Justice, however, must be done to those already in our midst. The rights of citizenship should be granted to Oriental immigrants when they are able to qualify for it. They have been lawfully admitted to our country and must be given a fair chance to succeed. Our

present treatment of the Orientals is economically unsound and contrary to our political ideals. Their desire to remove the stigma of racial inequality will likely gain increasing support. A just and constructive Oriental immigration policy must be worked out if peace with the Orient is to be maintained.

"Training for Community Work" was the subject of a paper read as the opening discussion of the annual meeting of the Association of Training Schools for Professional Work at Milwaukee, June 22, 1921.

The historical development of community work is traced together with the corresponding changes that have taken place in the curricula of training schools in order to meet the needs of this new field. The recent conceptions of community work are pointed out and its importance shown in the varied fields of social betterment. Emphasis is placed on the necessity of reconstructing the curricula of training schools of social work with a view to giving the courses on community work a place of fundamental importance. It is especially urged that increased attention be given to the social sciences as a means of grounding the students in the underlying principles of their later practical work.

MR. STEINER is continuing his study of the methods and principles of community organization especially in their application to communities in the South. A bulletin on this subject will appear during the year. There is also being prepared a syllabus and source book for a course in community organization. He will direct special research during 1921-1922 into the methods of Poor Relief in North Carolina, and will devote special efforts to the work of *The Bureau of Community Service* for the University Extension Division.

HAROLD D. MEYER will make special studies of Recreation Programs and of Juvenile Delinquency Problems in North Carolina. Of special importance will be his investigations into the working of the Juvenile Court Law and the special need for ample provisions for probation.

WILEY B. SANDERS will continue his study of Modes of Adaptation to Human Environment, as outlined in his abstract. He will take as this year's special problem the study of Poor Relief in North Carolina, and study the examples of mal-adaptation to environment.

Abstracts of theses presented in candidacy for the degree of Master of Arts are appended:

The Development and Correlation of Social Agencies in North Carolina. By Roy M. Brown.

This paper attempts to show that the social institutions and agencies of North Carolina have been materially influenced by physical environment—by the abundance and fertility of land. It traces the development of education as it is consciously related to the public welfare. It attempts to show that the development of educational ideals has followed the evolution of democratic social ideals; that the development of educational ideals in North Carolina has been from the theory of child training as a family function to the theory of education as a community affair; and that there has been progress toward the adaptation of the curriculum of the school to the new ideals. It presents the list of social institutions and agencies in the state, and outlines their organizations and functions. And finally it proposes a plan for the organization of all the social forces of the state and the correlation of their work. The machinery proposed for this organization is a federated State Council of Social Agencies based on the community organized with a county council at its head.

An Attempt to Determine the Modes of Adaptation to Human Environment. By Wiley B. Sanders.

This thesis is the beginning of a three-year study of objective measurements of social phenomena, especially as they relate to the progress of individuals and communities. The scope, therefore, of this part is to show simply but conclusively, the general history of past or current similar attempts; to indicate the need and practicability of such measurements; to describe sufficient modes of measurement to illustrate fully the thesis; to point out with numerical measurements certain facts and conditions typifying the problem and its solution; and to pave the way for concrete and exhaustive studies which shall bring to its conclusion the original thesis that social science and social work must function best through the scientific measurement of social facts, social character and social action. Enough illustrations have been provided to give clear exposition to the theme and to serve as an actual working basis for determining the welfare of individuals and communities in a limited way.

DEPARTMENT OF ZOOLOGY

H. V. WILSON. The Genus Raspailia and the Independent Variability of Diagnostic Features. Read before the North Carolina Academy of Science, April 29, 1921 (in press *Jour. Elisha Mitchell Sci. Soc.*).

Following Vosmaer and selecting *Raspailia viminalis* as incorporating the characteristics of this genus of ectyonine sponges, a review of the existing species is made, which shows that during the course of evolution the characters have varied independently. Thus species referred by common consent to Raspailia depart in very different ways from the type, representing several combinations of the generic characters. On this basis the suggestion is made that variation may possibly have altered or wiped out, in a single line of descent, so many characters that the relationship of the species affected to Raspailia may have become unrecognizable *in the present state of our knowledge of what is hereditary in this group.* The genus is defined and the American species, one from the Carolina coast, are listed.

H. S. EVERETT. The Germ Cells of Hydra (thesis for the M.A. degree).

The origin of the germ cells in Hydra is discussed from the standpoint of Weismann's theory of the germ plasm. The facts seem clearly to oppose this theory, since both eggs and sperm are, in their origin, directly traceable to ordinary interstitial cells.

The egg is described as arising by the coalescence of several large cells at the center of the ovary. It grows for some time by a similar process, but later becomes amoeboid, after which it ingests the cells between itself and the ectoderm by means of pseudopodia. In the multinucleate mass formed by the coalescence of the large cells one nucleus remains as the egg nucleus, the rest degenerate.

THE GRADUATE CLUB

At a general meeting of the Graduate School on the evening of October 1, 1920, an address of welcome was made by President Chase. The principal address of the evening was by Dr. Francis Preston Venable, Kenan Professor of Chemistry, on the subject of Scientific Research at the University of North Carolina. Much of the charm of this address consisted in the anecdotes about early days of research at the University; some of the facts given by Professor Venable are contained in some paragraphs written by him for the *Sigma Xi Quarterly* (viii, 3). An abstract from this article follows:

The University of North Carolina is the oldest of State Universities in point of service, having opened its doors in 1795. Its first president, Joseph Caldwell, was at first professor of mathematics, and science was at all times of absorbing interest to him. He was commissioner for North Carolina in running the boundary line with South Carolina besides doing important work in locating railways and a proposed canal. Under his presidency the State authorized in 1822 a geological and mineralogical survey which was placed in charge of the University. Professor Olmstead, who afterwards returned to Yale and later became State Geologist of New York, published what was probably the first report issued by any state survey. The second report was published by Dr. Elisha Mitchell.

In 1824 Caldwell sailed for England to purchase books and instruments for the University. Among these were a number of astronomical instruments which were first used for instruction and observation on a platform erected upon the roof of the president's house. In 1830 a small observatory was erected in which classes were instructed and many observations on celestial phenomena made. The records of these observations were lost and the instruments scattered and broken up during the occupation and reconstruction period. So far as known this was the earliest observatory connected with an educational institution. Caldwell and Mitchell published text-books for their classes and the latter contributed scientific articles to *Silliman's Journal.* Mitchell continued, unaided by the state, his surveys and investigation of the resources of the state. Among other things he measured the height of the peak named for him, Mt. Mitchell, which is the highest peak east of the Rockies. He lost his life in his last ascent of this peak.

Probably the most distinguished scientific investigator in the first seventy-five years of the University's activity was Nicholas M. Hentz, who became an authority upon spiders, publishing a book on the spiders of the United States in addition to a considerable number of papers in various journals.

With the coming of the Civil War the activities of the University were reduced to a minimum. Out of fourteen members of the faculty who

volunteered seven gave up their lives and out of its list of alumni who were capable of bearing arms about one-third were killed. From 1867 to 1878 its doors were practically closed except for a semi-high school kept up by the reconstruction administration. During the last three or four years of this period there being no faculty and no students the doors were left open to wind and weather and any chance marauder.

The reöpening in 1875 was undertaken chiefly on hope and faith. The state had no funds. Its whole system of education, which stood high in the middle of the century, had been practically destroyed. Friends and alumni raised $20,000 for repairs and equipment. It was little short of a tragedy. But a splendid fight was made and with the passing years the victory has been won without outside aid. . . . The first faculty after the reöpening was made up of young men. President Battle was a far-seeing man and began building anew the school system by establishing the first summer school for teachers in the country. The early graduates went out as missionaries in the cause of education to every nook and corner of the state. For two of these pioneers statues have been erected in the grounds of the State Capitol by a grateful people. Doctor Battle was also deeply interested in science and devoted what funds he could get to develop this side of the University work.

In 1883, four young professors, whose combined age was less than a century, met and decided that the old scientific spirit must be restored and fostered. To this end the Elisha Mitchell Scientific Society was founded and its first thin volume issued in 1884. No financial aid could be extended to it by the University for a number of years, but its Journal appeared with increasingly valuable contributions; first one annual number, then semi-annually and at last quarterly. Thirty-five volumes have appeared, comprising nearly 10,000 pages. The contributions have come chiefly from the faculty and students of the University. The boyish spirit of adventure and trust in the future was shown by the young group of four dubbing themselves "Hump, Rump, Mike, and the Blank." The Blank died a tragic death a few years later. Rump, meaning Count Rumford, became the first Director of the United States Bureau of Mines and was better known as Dr. Joseph A. Holmes. Mike, a name which meant no lack of respect for the great Faraday, was Phillips, who became State Geologist for Texas and then President of the Colorado School of Mines. These three have passed to the Great Beyond. The only one now living is the writer of this article, who dared assume, with some camouflage, the name of Sir Humphrey Davy.

It is difficult to estimate the influence upon the University of this society with its monthly public meetings. The spirit of investigation penetrated all departments and later historical, philological, and educational journals appeared, all of which have taken a recognized place in their distinctive fields.

At the close of the meeting a Graduate Club was formed. The officers of the club for the first term were Edwin S. Lindsey,

president; Sylvia Latshaw, secretary, and John L. Aycock, treasurer. During the second term Henry R. Totten served as president, John L. Aycock as secretary, and Charles L. Smith as treasurer. Seven meetings were held in the course of the year, the purposes of these meetings being to bring about better acquaintance among research workers, both teachers and students, in the various departments; to give to the Graduate School something of the unity of spirit of other professional schools; and to develop a sense of the method of research in various fields. This study of method, it was felt, could be most fruitful if the papers presented to the club were regarded not as contributions to learning but as illustrations of the kinds of problems confronting investigators in widely different fields of learning and of the method by which such problems are attacked. As studies in comparative method, therefore, these meetings had unique value. Abstracts of papers read at the meetings are appended, though these abstracts do not bring out in any very satisfactory way the comment, the illustrations, the blackboard drawings, and the method of exposition through which the speakers made real their problems. What is here presented as a summary was often treated in such a way that students might see the genesis of the problem and the various steps through which the solution was approached.

FIRST MEETING

The club was addressed at its first meeting by Professor James H. Hanford, of the Department of English. Professor Hanford's address consisted of an explanation of the steps he had taken in defining and solving a problem in the life of Milton by the use of the extant manuscripts. Milton's *Commonplace Book* was the chief document in question. Professor Hanford showed how by the application of certain paleographical tests it was possible to unravel the tangle of entries made at different periods of Milton's life and to use the results of the process in reconstructing a scheme of the poet's reading and a new record of his developing thought and opinion over a long period of years.

SECOND MEETING

At the second meeting the principal address was made by Professor J. F. Dashiell, of the Department of Psychology, who spoke on "The Development of Technique in Animal Psychology." An abstract of this address follows:

The interest in the animal mind that was revived with the "Darwinian revolution" in biology took at first the form of the collecting of anecdotes and observations of animals and a subjective analysis of these. A radical departure from this "armchair method" was shown in a distinctly experimental study of animal learning by Thorndike in 1898. Since then experimental work on animal psychology has been carried on vigorously by many hands. The development of experimental technique makes an interesting continuous story, the elaboration of theories and problems depending upon elaboration of apparatus and methods. In general, for the study of vertebrate animals this development has been in three directions: the refinement of discrimination boxes (for testing sensory capacities), of problem boxes (for learning of finer motor coördinations), and of mazes (for learning of grosser locomotor activities). The last has been especially widely used, and on at least some species for each of the orders of vertebrata and other phyla as well.

Finally, the ever new interest in comparison between animals and man has led to experimentation along lines of qualitative analysis of types of reactions as the basis for comparison.

THIRD MEETING

At the third meeting Professor William deBerniere MacNider, of the Department of Pharmacology, spoke on the subject of research in various departments of medical investigation. He told of some incidents in his own career as an investigator, with illustrations of the progress in medical research in his own and other fields. Finally, he spoke of the fascination of a life devoted to research, and of the spiritual values of research.

FOURTH MEETING

At the February meeting of the Graduate Club, Dr. W. W. Pierson talked on "The Truth in History." "We are all historians," said Mr. Pierson. "There are histories in every field of knowledge, and there is even a history of history. History is a standard bearer of patriotism, the justification of successful causes and the vindication of unsuccessful causes; it is the soul of nationalism.

"The research student in history is confronted by certain problems. The duty of history is to describe events and to interpret them. A movement occurs, a man dies. The historian interprets these things. His interpretation becomes important; his belief about what actually occurred gets possession of people's minds, and this belief may become as important as the actual fact. The truth is not only the fact, but what people believe to be true."

Dr. Pierson in the course of his talk brought out four principles that the historian should and must observe in the discovery of truth. "First, the historian must be accurate; he must discern as far as possible where, when and why an event took place. Secondly, he must appreciate certain influences—personal, ethical, social, geographical, and many others. Thirdly, the historian must possess a certain rational sense. He must be free from sentiment, and he must preserve a sense of detachment from the subject and intellectual impartiality. Lastly, the historian should have a certain faculty of following leads. A very small fact may lead to an important discovery if the investigator approaches it with an open mind and some degree of imagination."

FIFTH MEETING

The March meeting of the club was held in Gerrard Hall, in order that all the seniors, the women students, and the faculty members and their wives might hear Professor Frank C. Brown, of Trinity College, speak on North Carolina Ballads and Other Folk Songs. Professor Brown was assisted by Miss Rosa Warren, who sang several of the songs in a very pleasing manner.

Professor Brown's talk was limited to one of the twelve divisions of Folk-Lore, the Folk Songs, which includes most of the popular ballads. Ballad springs from the French word "ballet," to dance. It is generally supposed that the ballad originated in the folk dances, with no conscious literary authorship but Professor Brown pointed out that it is possible that in some rare cases ballads have had individual authorship. A ballad, he said, is a "story flashed at us in song," a story in a dance. Its chief characteristic is that it is intended to be sung.

Other features to be noted are constant repetition, the refrain, the commonplace endings, the chorus, the dialogue. The ballads deal with a variety of subjects: love, friendship, the emotions, ideal womanhood and manhood, enchantment, outlaws, and domestic relations of all kinds. Throughout the talk Professor Brown called on Miss Warren to illustrate certain types of folk-songs.

SIXTH MEETING

At this meeting Professor William C. Coker, Kenan Professor of Botany, spoke on the subject of "Human Progress and the Scientific Method." An abstract of this address is appended:

The scientific method can be clearly defined; human progress cannot be so clearly defined. Thought controls the first; emotion controls the second. But progress may be fairly well defined as improvement in physical health and beauty, growth in intellectual power and control of nature, elevation of the emotional (spiritual) life, and increase in human sympathy through a larger justice. It is towards this end that the scientific method operates. What is this scientific method? First, the object: to discover facts, to classify these facts and to establish from them principles and laws so that the truth may be found and made available for the use of mankind. In human life its object is to increase man's control over nature, helping him to find what is really the true, the beautiful and the good that he may order his life accordingly. Second, the attitude: It is (a) unselfish; (b) it assumes that nature is orderly and "natural," and that this order will yield to the scrutiny of man. In the third place, scientific method depends largely on observation and experiment. The value of laborious experiment is greater than the ingenuity of a vigorous mind.

The purpose of the scientific method is to gain knowledge that will forward human progress. Scientific method points out what is true and what is false; based on orderly and constructive thinking it corrects the tendency of the emotions to accept false standards; it is not the emotions that distinguish man from the animals, but it is in the intellect that man reaches his high destiny, and in this alone.

Professor Coker, throughout his talk, took illustrations of his points about the scientific method from the great masters of science. The history of the method was traced from Thales, Democritus, and Aristotle; but it was pointed out that few scientific experiments, in the modern sense, were made by the ancients. As an example of ancient error resulting from lack of experiments, Professor Coker traced the history of spontaneous generation. It was believed in by all the ancients, and this belief persisted in nearly every thinker from Aristotle to Pasteur, including Harvey and Van Helmont. But light was thrown on the subject by the experiments of Francesco Rede, and Pasteur completed the demoli-

tion of the theory by his practical, simple experiments. The true scientific method was begun in the sixteenth and seventeenth centuries by such men as Vesaleus, Galileo, and Harvey; and from that time to the present the advance in human progress has gone steadily ahead, and this progress will continue in proportion to the increase in scientific investigation.

SEVENTH MEETING

At the last meeting of the year, held shortly before Commencement, members of the senior classes of the College of Liberal Arts and the School of Applied Science were guests of the Graduate Club. Brief addresses were made by President Chase and Dean Greenlaw, the general subject being "Research in Its Relation to Modern Life." These addresses sought: (1) to bring to the consciousness of men about to complete their undergraduate course a sense of the relationship between research and the life of the University; (2) to give a series of tests by which a young man, on the point of taking his first degree, might be helped to answer the question as to whether he ought to go on with graduate work; and (3) to show the importance of research, even of research that has no immediately apparent practical aim, to modern civilization. The meeting sought therefore to impress both the man who felt the impulse to enter upon a career of scholarship and the alumnus who would go at once into business or professional work, with a sense of the deep significance of research as the true foundation of the authority of the University.

SEMINAR IN DANTE

For several years it has been the custom to invite a scholar of established reputation to visit the University for a week and to conduct a brief intensive course for advanced students in the Division of Languages and Literatures. A syllabus is provided, and the group of students holds a number of meetings, under the direction of a member of the local staff, before the arrival of the lecturer. During this period of preparation, as well as during the week of the seminar, students do a great deal of reading in the books named in the syllabus, and they are excused from attendance on classes in the Division during the week when these intensive studies are being presented. Six sessions, of two hours each, are held, and the group, limited to graduate students and seniors, is sufficiently small to insure discussion and personal acquaintance with the lecturer. Holders of this appointment have been Dr. J. E. Spingarn, of New York; Professor Edwin Mims, of Vanderbilt University; Professor Raymond M. Alden, of Leland Stanford, Junior, University; Professor John M. Manly, of the University of Chicago, and, in 1921, Professor Charles H. Grandgent, of Harvard University. An abstract of the work of Professor Grandgent, who devoted his attention to the subject of Dante, as a part of the University's commemoration of the sixth centenary of Dante's death, is appended. The sessions were held during the week of February 6-11, 1921.

The first session was devoted to some consideration of the circumstances surrounding Dante at his birth and the influences on his own early work. An analysis was given of the *Vita Nuova.* The relation of this work both to Dante's life and to his later life and thought was brought out, with a review of various theories concerning the allegorical nature of the *Vita.* The particular point made in conclusion was that the *Vita* serves as an introduction to the great epic.

The first part of the second session was devoted to a review of Dante's life and work between the death of Beatrice and the beginning of his work on the *Divine Comedy.* His studies, as reflected in the *Convivio, De Vulgari Eloquentia,* and *De Monarchia,* were outlined, but these works were treated as subsidiary to the greater interest and importance of the poem by which Dante is best known. The remainder of the session was devoted to a preliminary survey of the *Divine Comedy,* the principal topic being the allegorical journey and its medieval analogues. Some attention was paid to Dante's cosmogony and to his theory of the kinds of allegory, with the

relation of this to the work of St. Thomas Aquinas. At the third session the topic for discussion was Dante's temperament, most of the illustrations being drawn from the *Inferno*. From Dante's conversations with various lost souls we learn his attitude on religious and political questions of his day; his mingled love and hatred for Florence; his support of the Empire, and his admiration for Virgil, who stands as the type of human wisdom.

The fourth session dealt with characterization and description in the poem. Many illustrations were given, drawn from all parts of the poem, of Dante's power of describing persons and places, the revelation of personality through dialogue, autobiography, and short biographies, as well as his references to animals, especially to birds, and his descriptions of places, such as the Garden of Eden. The point was made that while there is little scenic description there is much suggestion of things not describable: the violence of storms; the majesty of the stars.

The fifth and sixth sessions were devoted to aspects of Dante's philosophy. In the first, Dante's ideas of happiness were illustrated: the earthly happiness of Eden, based on purity, activity, fame, and knowledge; the heavenly happiness of Paradise, based on understanding, intuition, fellowship, submission. Understanding and intuition will give the answers to all the vexed problems of the universe. This will be particularly dear to Dante, the insatiable seeker for knowledge. Fellowship with the other blessed spirits will also bring happiness to the exiled wanderer. Finally, submission to the will of God through an everlasting act of the free human will brings the perfect bliss of union with God without the loss of individual personality. At the last session the topics for discussion were centered upon Dante's ideas of justice, temporal and divine. Justice on earth could be secured only through the revival of the Empire; this idea permeates Dante's whole work. Divine justice, the will of God, was illustrated by many passages cited from the poem, particularly from *Paradiso*.

INDEX

Adams, R. W. 24-25
Administrative Board 3-4
Anatomy, Department of 5
Anderson, R. R. 18
Andrews, T. M. 8-9
Arrowood, F. M. 18
Atkins, E. W. 44-45, 46
Aycock, John L. 25-26
Babb, J. S. 31
Bacon, Mabel L. 19
Batts, Katherine 46
Botany, Department of 6-8
Brown, Frank C. 59-60
Brown, R. M. 53
Butt, W. H. 31
Capps, J. A. 19-20
Carroll, D. D. 16
Cates, C. L. 18
Chemistry, Department of 8-13
Civil Engineering, Department of 13-15
Clegg, Agnes M. 26
Clegg, Elsie 34-35
Cobb, Collier 29
Coker, W. C. 6-7, 60-61
Couch, J. N. 7-8
Dante, Seminar in 62-63
Dashiell, J. F. 45-46, 58
Dawson, Paul R. 11
Dey, W. M. 47
Economics and Commerce, Department of 15-17
Education, Department of 18-21
Elliott, A. P. 26-27
English, Department of 22-29
Everett, H. S. 54
Foerster, Norman 23
Frazer, K. C. 35-36
Geological and Economic Survey, N. C. State 13, 31
Geology, Department of 29-33
George, W. C. 5-6
Giles, I. V. 12
Glenn, W. D. 45
Government Stations at the University 13, 15
Graduate Club, The 3, 55-61
Graduate School—A Union of Scholars 5

Grandgent, Charles H.....62-63
Grant, F. A.....7
Greenlaw, Edwin.....3-5, 22-23
Hamilton, J. G. deR.....34
Hancock, R. K.....18
Hanford, J. H.....23-24, 57
Harrer, G. A.....38
Hatcher, J. T.....18
Hathcock, J. Q.....18
Henderson, Archibald.....39
History and Government, Department of.....34-37
Hosea, W. H.....45
Howe, George.....37-38
Huse, H. R.....48-49
Jones Ford Quadrangle, Geological Map of.....30
Jones Ford Quadrangle, Soil Map of.....32
Jones, W. B.....31
Knight, E. W.....18-19, 34
Lasley, John W.....39-40
Latin, Department of.....37-38
Latshaw, H. F.....20-21
Latshaw, Slyvia A.....21
Leavitt, S. E.....47-48
Ledford, R. N.....18
Lee, S. B.....31, 33
Lindsey, E. S.....27
MacNider, W. deB.....40-43, 58
Mangum, Charles S.....5
Martin, L. DeW.....36-37
Mathematics, Department of.....39-40
Matherly, Walter J.....16
Meyer, H. D.....52
Miller, J. B.....31
Murchison, C. T.....16
Newton, G. Y.....18
Norfleet, A. C.....45-46
Odum, Howard W.....49-50
Patrick, Bailey.....46
Peacock, E. E.....16
Pharmacology, Department of.....40-43
Physics, Department of.....43-44
Pickens, W. M.....18
Pierson, W. W.....34, 58
Pratt, Joseph H.....29
Priest, P. D.....44
Prouty, W. F.....29

Psychology, Department of....44-47
Ranes, Arthur.... 18
Reid, Louisa P.... 28
Renegar, H. C.... 18
Research Fund.... 3
Romance Languages, Department of....47-49
Rural Social Science.... 49
Sanders, W. B.....52, 53
Saville, Thorndike.....13-15
Short, G. A.... 18
Sipe, Bryan W.....16-17
Smith, Charles G.... 28
Smith, S. C.... 8, 13
Smithey, Ira W.... 9-11
Sociology, Department of.....49-53
Spainhour, J. F., Jr.....28-29
Sprinkle, T. W.... 18
Steiner, J. F.....50-52
Stuckey, J. L.... 31
Stuhlman, O., Jr.....43-44
Taylor, H. M.... 12
Teu, S. B.... 46
Totten, H. R.... 7
Towles, Oliver.... 47
Venable, F. P.....55-56
Wagstaff, H. M.... 34
Weatherly, C. H.... 18
Wheeler, A. S.... 8-13
Whitener, R. W.... 18
Wilson, H. V.... 54
Zoology, Department of.... 54